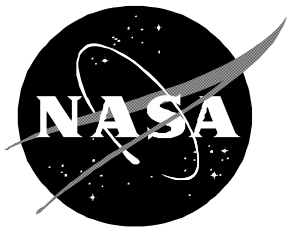

National Aeronautics and Space Administration

August 12, 2002
AO 02-OSS-xx

Draft Announcement of Opportunity

Explorer Program

Small Explorers (SMEX) and Missions of Opportunity

Comment Due Date: **September 6, 2002**

NOTICE

This document is a Draft Explorer program Announcement of Opportunity (AO) for two different types of investigations - Small Explorers (SMEX) and Missions of Opportunity.

The International Space Station (ISS) opportunities described in this draft AO are based on the plans and policies for ISS and Space Shuttle use in place at this time. These policies and plans are currently undergoing review, and changes that occur might affect the offerings in this AO. Proposers interested in ISS opportunities should read this AO carefully when it is released as these offerings may have changed.

All comments should be directed to the Explorer Program Scientist, as designated below, by the comment due date on the cover of this draft AO. Comments are preferred in writing and may be sent by fax or E-mail; the character string "SMEX DRAFT AO" (without quotes) should be included in the subject line of all transmissions.

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SMALL EXPLORER AND MISSIONS OF OPPORTUNITY
ANNOUNCEMENT OF OPPORTUNITY

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FOREWORD

This document is an Explorer program Announcement of Opportunity (AO) for two different types of investigations - Small Explorers (SMEX) and Missions of Opportunity.

Section 1, Description of Opportunity, provides a brief introduction describing the scope of the solicitation, the two types of investigations that may be proposed in response to this AO, a summary of the selection process, and the schedule. Section 2, Explorer Program Goals, Objectives, and Background, and Section 3, Explorer Program Constraints, Guidelines, and Requirements, are applicable to both SMEX investigations and Missions of Opportunity investigations. Section 4 describes SMEX investigations and SMEX-specific requirements. Section 5 describes Missions of Opportunity investigations and Missions of Opportunity-specific requirements. Section 6, Proposal Preparation and Submission; Section 7, Proposal Evaluation, Selection, and Implementation; and Section 8, Conclusion, are applicable to both SMEX investigations and Missions of Opportunity investigations.

Proposers interested only in SMEX investigations should read Sections 1, 2, 3, 4, 6, 7, and 8 and any Appendices referenced in those sections.

Proposers interested only in Missions of Opportunity should read Sections 1, 2, 3, 5, 6, 7, and 8 and any Appendices referenced in those Sections.

Proposers should be aware of the following major changes in this AO from recent Explorer solicitations.

- For this AO, SMEX and Mission of Opportunity investigations may <u>not</u> be proposed to be launched using the Space Shuttle, with the exception of International Space Station payloads.

- If project management and end-to-end systems engineering are to be implemented from a NASA Center, then these functions must be performed by either the Jet Propulsion Laboratory or the Goddard Space Flight Center, as directed by the Office of Space Science.

In addition to the listed major changes, this AO incorporates a large number of additional changes including both policy changes and changes to proposal submission requirements. All proposers must read this AO carefully, and all proposals must comply with the requirements, constraints, and guidelines contained within this AO.

1.0 DESCRIPTION OF OPPORTUNITY

1.1 General Provisions

The National Aeronautics and Space Administration (NASA), Office of Space Science (OSS), announces the opportunity to conduct space science investigations through the Explorer program. For the purposes of this announcement, the term "space science" encompasses the scientific objectives of the following OSS science themes:

- Astronomical Search for Origins;
- Structure and Evolution of the Universe; and
- Sun-Earth Connection.

For the purposes of this announcement, the Structure and Evolution of the Universe theme should be understood also to include tests of the fundamental laws of physics as they might be relevant to astrophysics and cosmology. Examples include tests of gravitational physics, general relativity, early universe physics, and high-energy physics. For the purposes of this announcement, the Astronomical Search for Origins theme should be understood also to include astrobiology and planet finding.

Additional information concerning these themes is provided through appropriate links found on the Office of Space Science homepage at the World Wide Web address http://spacescience.nasa.gov/ and in the space science roadmaps found in the Explorer Program Library (Appendix C).

Proposals submitted in response to this Announcement of Opportunity (AO) must be for investigations encompassing all appropriate mission phases. NASA mission phases, as defined by NASA Procedures and Guidelines (NPG) 7120.5A, *NASA Program and Project Management Processes and Requirements*, are Formulation, Approval, Implementation and Evaluation. For the purposes of this AO, the NASA mission phases are divided as follows. Formulation is divided into: Phase A – Concept Study, and Phase B – Definition and Preliminary Design. Approval is the process for transitioning into Implementation, which for Explorer missions is the steps leading to a Confirmation Review with the Associate Administrator for Space Science. Implementation is divided into: Phase C – Detailed Design and Development, Phase D – Integration, Test and Launch Operations (extending through in-orbit checkout, usually launch plus 30 days), and Phase E – Mission Operations and Data Analysis. Phase E is to include analysis and publication of data in the peer reviewed scientific literature and delivery of the data to an appropriate NASA data archive. The Evaluation process is not a separate phase, but is the ongoing independent review and assessment of the project's status during both Formulation and Implementation. The document NPG 7120.5A, *NASA Program and Project Management Processes and Requirements*, may be found in the Explorer Program Library (Appendix C).

This AO invites proposals for Small Explorer (SMEX) missions and for Missions of Opportunity, which includes participation in space missions that are sponsored by organizations other than OSS.

- SMEX investigations are free flyers launched on expendable launch vehicles or attached payloads on the International Space Station. Further description of SMEX investigations is given in Section 4.0. Depending on the availability of proposals of appropriate merit, NASA intends to select two SMEX missions, one to launch by February 2007, and one to launch by February 2008.

- Participation in Missions of Opportunity may be undertaken through the Explorer program when the perceived value is high and the proposed cost to NASA OSS is within the funding limits of the Explorer program. NASA is not obligated to select a Mission of Opportunity under this solicitation. The Explorer program expects Missions of Opportunity, like SMEX investigations, to meet other program objectives for reducing cost, injecting new technology, and enhancing education and public outreach. Note that if a Mission of Opportunity is selected, a reduced flight rate of future Explorers will result. For this AO, investigations to be flown on the International Space Station (ISS) and investigations flown on long duration balloons (LDB's) may be proposed as Missions of Opportunity, in addition to investigations involving participation in space missions that are sponsored by organizations other than OSS. Further information on Missions of Opportunity is given in Section 5.0.

1.2 Proposal Evaluation and Selection Process

The selection process will be done in two stages. In Stage 1, proposals will be assessed against criteria given in Section 7.2 by panels of individuals who are peers of the proposers in the relevant scientific and technical areas. Proposals will be categorized in accordance with the NASA Federal Acquisition Regulation Supplement (NFS) Part 1872.0. The results of the proposal evaluations and categorizations will be reviewed by the Space Science Steering Committee that will conduct an independent assessment of the evaluation and categorization processes. After this review, the final evaluation and categorization results and the total proposed cost will be presented to the Associate Administrator for Space Science, who will make the selections for a five-month Phase A concept study. It is anticipated that up to four SMEX missions will be selected for concept studies. Each SMEX Phase A study will be funded up to $500K in real year dollars. NASA may also select investigations to conduct concept studies for Missions of Opportunity; however, NASA is not required to make such a selection under this solicitation. Each Mission of Opportunity Phase A study will be funded up to $250K in real year dollars.

For Stage 2, NASA will conduct a detailed review of the Phase A concept study results to evaluate the implementing details of the selected investigations, namely, any modifications of the scientific objectives, the proposed cost to NASA, design details of the investigation hardware, plans for mission implementation, including all technical and management factors, details of the education and public outreach programs, plans for any

new/advanced technology, and plans for participation of small disadvantaged businesses and minority institutions. As a result of this second evaluation, NASA intends to select two SMEX investigations, and possibly one or more Mission(s) of Opportunity, for implementation leading to flight. Sections 7.1, 7.2, and 7.3 provide additional details on these activities.

1.3 Proposal Opportunity Period and Schedule

NASA is soliciting SMEX investigations with mission launch dates no later than February 2008, with one launch anticipated by February 2007 and the other by February 2008. SMEX investigations with an anticipated launch date later than February 2008 should be proposed in response to a subsequent SMEX AO.

NASA is soliciting Missions of Opportunity involving participation in space missions that are sponsored by organizations other than OSS through this AO where a commitment from NASA is required by the sponsoring organization before December 31, 2005. The launch dates may be at any time. Missions of Opportunity of this type requiring later commitment dates should be proposed in response to a subsequent Explorer program AO.

NASA is also soliciting Missions of Opportunity involving long duration balloon or ISS investigations with launch dates no later than February 2008. Investigations of these types, with an anticipated launch date later than February 2008, should be proposed in response to a subsequent Explorer program AO.

The following schedule describes the major milestones for this SMEX and Missions of Opportunity AO.

AO release	February xx, 2003
Preproposal Conference	February xx, 2003
Notice of Intent to Propose due	March xx, 2003
Proposal submittal due by 4 p.m. ET	May xx, 2003
Non-U.S. Letter(s) of Endorsement due	May xx, 2003
Selections for Phase A Concept Study (target)	October 2003
Award date for Phase A Concept Study (target)	November 2003
Phase A Concept Study Report due (target)	April 2004
Downselections for Flight (target)	August 2004

2.0 EXPLORER PROGRAM GOALS, OBJECTIVES, AND BACKGROUND

2.1 Space Science Research Goals

The scientific goals of space science research within the Office of Space Science are generally contained in *The Space Science Enterprise Strategic Plan* (November 2000). See the Explorer Program Library (Appendix C) for access information for this and related documents describing OSS scientific goals. The scientific goals in these referenced documents as they relate to the NASA science themes listed in Section 1.1

will form the basis of the science evaluation criteria. Further information on the science themes may be obtained through appropriate links found on the Office of Space Science homepage at the World Wide Web address http://spacescience.nasa.gov/.

The goals and strategies outlined in these documents encompass a wide range of scientific questions spanning a variety of scientific disciplines that NASA seeks to address by supporting investigations in three broad categories: (1) laboratory research and theoretical analyses; (2) ground-based astronomical observations; and (3) flight projects. This AO solicits only those investigations that fall into the third category.

2.2 Explorer Program Objectives

Explorers are space physics and astronomy missions intended to study the Sun, to examine the space environment of the Earth and other planets, and to observe the universe beyond our Solar System.

The Explorer program seeks to conduct scientific investigations of modest programmatic scope. The program intends to provide a continuing opportunity for quickly implemented flight missions that conduct focused investigations that complement major flight missions, prove new scientific concepts, and/or make other significant contributions to space science.

The Explorer program is designed to accomplish frequent, high quality space science investigations utilizing innovative, streamlined, and efficient management approaches. It seeks to reduce cost and improve performance by selecting investigations for which investigators will commit to cost limits, control business and technical processes, and apply new technology. Finally, it seeks to enhance public awareness of, and appreciation for, space science and to incorporate educational and public outreach activities as integral parts of space science investigations.

2.3 Program Background

The Explorer program provides several classes of flight opportunities for the science themes described in Section 1.1. Changes to the Explorer program have been designed to increase the number of flight opportunities in response to recommendations from the scientific community. These changes include providing new classes of Explorer missions and opening up additional opportunities within each class. Explorer program classes are characterized by the scope of the mission, based primarily on cost and secondarily on payload size and launch vehicle capabilities. The current Explorer program classes are as follows:

- University-class Explorers (UNEX) are investigations characterized by definition, development, launch service, and mission operations and data analysis costs not to exceed $15 million (in Fiscal Year 2000 dollars) total cost to NASA OSS.

- Small Explorers (SMEX) are investigations characterized by definition, development, launch service, and mission operations and data analysis costs not to exceed $100

million (in Fiscal Year 2003 dollars) total cost to NASA OSS. NASA intends to launch one Small Explorer mission per year.

- Medium-class Explorers (MIDEX) are investigations characterized by definition, development, launch service, and mission operations and data analysis costs not to exceed $180 million (in Fiscal Year 2002 dollars) total cost to NASA OSS. NASA intends to launch one MIDEX mission per year.

- Missions of Opportunity are investigations characterized by being part of a non-OSS space mission of any size, but having a total NASA OSS Cost that is typically under $35 million (in Fiscal Year 2003 dollars). These missions are generally conducted on a no-exchange-of-funds basis with the organization sponsoring the mission. NASA also solicits small investigations as specified in each AO, such as long duration balloon and ISS investigations, as Missions of Opportunity. NASA intends to solicit proposals for Missions of Opportunity with each AO issued for UNEX, SMEX, and MIDEX investigations. For each AO, the cost limit for Missions of Opportunity is expected to be constant, adjusted only for inflation.

3.0 EXPLORER PROGRAM CONSTRAINTS, GUIDELINES, AND REQUIREMENTS

3.1 Introduction

This section describes the constraints, guidelines, and requirements applicable to all Explorer program selections. Additional constraints specific to SMEX are in Section 4, and constraints specific to Missions of Opportunity are in Section 5. Specific directions for proposal preparation are included in Section 6.

3.2 General Program Constraints and Guidelines

The strategic role of the Explorer program is to address Space Science Enterprise science goals and objectives that can be executed within the scope of the Explorer program cost cap but are not addressed by missions explicitly included in the Space Science Enterprise Strategic Plan (see Appendix C).

The responsibility for implementing a selected investigation rests with the Principal Investigator (PI) and the investigation team, which will have a large degree of freedom with which to accomplish its proposed objectives with appropriate NASA oversight to ensure mission success (see the *SMEX Safety, Reliability, and Quality Assurance Requirements* document, available in the Explorer Program Library, Appendix C) while keeping the cost within the proposed cost cap. In accordance with NASA's transfer of program management responsibility to its Centers, NASA's Goddard Space Flight Center (GSFC) has been assigned program management responsibility for Explorers. In this role, which is separate from their role as a possible partner in the investigation, GSFC is responsible for NASA's fiduciary responsibility to ensure that Explorer missions are achieved in compliance with the cost, schedule, performance, reliability, and safety requirements committed to by the PI. The level of GSFC's involvement in this role may

vary from mission to mission, depending on the implementing organization and other programmatic considerations. It is expected that the GSFC Explorer Program Office will work with the selected Principal Investigators and implementing organizations to define roles and responsibilities to fulfill this responsibility in the most effective manner (see the *Example Mission Definition and Requirements Agreement*, available in the Explorer Program Library).

Once an investigation has been selected for flight, failure to maintain reasonable progress on an agreed upon schedule or failure to operate within the constraints outlined below may be cause for its termination by NASA. Every aspect of a selected investigation must reflect a commitment to mission success while keeping total costs as low as possible. Consequently, investigations should be designed and planned to emphasize mission success within cost and schedule constraints by incorporating sufficient margins, reserves, and resiliency. Only those investigations whose proposed cost, schedule, and launch vehicle requirements do not exceed the constraints and guidelines identified in this AO will be considered as candidates for selection for flight.

3.3 Science Requirements

3.3.1 General Data Policies

The relationship between the proposed scientific objectives, the data to be returned, and the instrument payload to be used in carrying out the proposed investigation must be unambiguous and clearly stated in the proposal. Explorer investigation teams will be responsible for initial analysis of the data, their subsequent delivery to an appropriate NASA data archive, the publication of scientific findings, and communication of the results to the public.

In accordance with NASA policy, data are to be released as soon as possible after a brief validation period appropriate for the mission. Explorer teams will be responsible for collecting the scientific, engineering, and ancillary information necessary to validate and calibrate the scientific data prior to depositing it in the appropriate NASA data archive. The time required to complete this process should be the minimum necessary to provide appropriate data to the scientific community and the general public and must be described in the proposal. As part of their funded Phase E activities, investigation teams must include an appropriate period for data analysis independent of archiving activities.

3.3.2 Options for Enlarging Science Impact (Phase F)

The science investigation proposed for this AO must be complete through Phase E (see Section 1.1). This baseline investigation must contain within the NASA OSS Cost cap all mission phases and activities required to accomplish the proposed goals and objectives. Options for enlarging the science impact beyond the baseline mission may be included in proposals to this AO. Science enhancement options include, but are not limited to, activities such as extended missions, guest investigator programs, general observer programs, participating scientist programs, interdisciplinary scientist programs, or archival data analysis programs. The proposal must define and describe any proposed

science enhancement option. For the purpose of this AO, these and any other science enhancement options will be collectively referred to as Phase F activities. As these proposed activities are options and are not included within the cost capped baseline investigation, the science enabled by Phase F activities is not considered as part of the scientific merit of the proposed investigation (Section 7.2.2).

Costs for Phase F activities must be included in the estimate of NASA OSS Cost (Section 3.6.3), but will not count against the NASA OSS Cost cap (Section 4.4.2 or 5.5) and shall be listed separately in cost summary tables. Note that funding for Phase F activities prior to Phase E should be minimized, and that NASA reserves the right to solicit and select all participants in such programs.

It is important to note that NASA considers any proposed Phase F activities as options. Inclusion of such options does not imply a commitment from NASA to fund them even if the baseline investigation is selected. NASA reserves the right to accept or decline proposed Phase F activities at any time during the mission; in particular, the decision may not be made at the time the baseline investigation is selected for flight. The process for deciding on Phase F activities may involve further reviews (e.g., a "Senior Review"). Extended mission proposals should be consistent with guidelines provided in the *Office of Space Science Mission Extension Paradigm* document; this document is included in the Explorer Program Library (Appendix C).

3.4 Technical Approach Requirements

3.4.1 General Policies

Investigations must encompass all technical aspects from the initial studies through delivery of the data to the appropriate NASA data archive and their analysis. The document NPG 7120.5A, *NASA Program and Project Management Processes and Requirements*, delineates activities, milestones, and products typically associated with each of these phases and may be used as a reference in defining a team's mission approach. This document is included in the Explorer Program Library (see Appendix C). Mission teams have the freedom to use their own processes, procedures, and methods, and the use of innovative processes is encouraged when cost, schedule, technical improvements, and reliability can be demonstrated. The Explorer Program is responsible for monitoring the PI's progress and maintaining sufficient insight into the development activities to insure that cost, schedule, and technical performance of the mission remains within established boundaries. These controls for monitoring are established in the *SMEX Safety, Reliability, and Quality Assurance Requirements* document that is included in the Explorer Program Library (see Appendix C). Mission teams shall abide by all applicable Federal (including NASA), state, and local laws and regulations.

Selected investigations shall have a product assurance program that is consistent with the requirements of the ISO 9000 series, American National Standard, *Quality Management Systems - Requirements*, ISO9001:2000; see the Explorer Program Library for references. The investigation's product assurance program must meet the requirements in the *SMEX*

Safety, Reliability, and Quality Assurance Requirements document, available in the Explorer Program Library.

3.4.2 Space Operations and Communications

Proposers are free to propose use of services from sources other than the NASA Space Communication and Data Systems (SCDS). Services provided by SCDS include support for communications, tracking, mission operations, flight dynamics, and data processing. Costs for such services, whether obtained from NASA or other sources, must be included in the cost estimate. Projects shall conduct trade studies on the use of SCDS-provided services versus any proposed alternatives. Explorer projects may optionally conduct such studies in Phase A, but shall conduct such studies no later than Phase B. SCDS-provided services shall be employed whenever they meet mission objectives at a life-cycle cost to the project or to OSS that is less than or equal to any proposed alternatives. SCDS will assist Explorer proposers in identifying SCDS services, prices, and cost trades. If OSS and SCDS agree that the proposed approach does not result in the lowest life cycle cost, OSS may direct the Explorer project to modify its approach. Information on NASA SCDS space communications capabilities and costing is given in the *NASA's Mission Operations and Communications Services* document, available in the Explorer Program Library.

3.4.3 Government Furnished Equipment

For purposes of this AO, the following items are considered Government Furnished Equipment (GFE):

- NASA-provided expendable launch services as described and costed in the *Expendable Launch Vehicle Opportunities* document in the Explorer Program Library; and

- NASA-provided balloon services as described and costed in the *Long Duration Balloon Opportunities* document in the Explorer Program Library.

Since GFE costs have been verified prior to the release of this AO, NASA will accept the published cost of a GFE option provided that the proposed application is consistent with the intended use of the GFE. Proposers must include the cost of GFE in their proposal, and such costs count against the NASA OSS Cost cap.

3.4.4 Available GSFC Services

PI's intending to submit a Stage 1 proposal may request up to 40 hours of support (per proposed mission) from GSFC, at no cost to the PI, in the areas of project management, end-to-end mission systems engineering, spacecraft, sensors/instruments, and ground/flight systems. GSFC will honor requests made within ten (10) business days of the release date of this AO. Support will be provided to the extent that resources/expertise are available in the areas requested.

GSFC may be added to the proposal team after a proposal has been selected for Phase A concept studies. For any PI selected for Phase A concept studies who so requests, GSFC can provide the project management, mission system engineering, spacecraft, ground system, and other support needed to complete the formulation and implementation of an investigation. GSFC will assist a PI during the Phase A concept study under a partnering arrangement to establish the technical, management, cost, and other approaches for formulating, developing, and implementing the investigation and will aid the PI in the preparation of the Concept Study Report. GSFC support for Phase A concept studies will be provided to the full extent requested and funded by the PI.

GSFC also offers focused, discrete services in the areas of spacecraft acquisition, mission concept design, instrument synthesis/analysis, and Space Shuttle/Space Station attached payload-related mission integration engineering and management, safety, mission implementation and carrier development. Each of these discrete services has well-defined products, which are described in the *Available GSFC Services* document in the Explorer Program Library (see Appendix C). These services are offered in both Stage 1 and Stage 2 (Phase A) as available resources permit. The cost of services, and acceptable means of payment, should be discussed directly with the designated point of contact for the service.

Proposals or concept studies utilizing available GSFC services are subject to full technical, management, cost and other factors review, as are any other proposals or reports. As required by the AO, the cost for concept study related services will be applied on a full cost basis by GSFC.

Full details regarding GSFC services and their acquisition are available in the document *Available GSFC Services* in the Explorer Program Library (see Appendix C).

3.4.5 International Space Station Requirements

Investigations may be proposed for flight on the International Space Station (ISS) as described in Sections 4.2.2 and 5.4. These flight opportunities are offered in this AO based on current policies regarding ISS access and utilization, and on milestones in the most recently approved ISS assembly schedule. At the time this AO was issued, ISS policies and schedule were uncertain as they underwent significant revision. To learn of any significant change to these policies or milestones, potential proposers should contact the point-of-contact in the *International Space Station Research Opportunities* document in the Explorer Program Library (Appendix C). If policy changes affect OSS's ability to offer ISS opportunities, or if milestones are delayed so that launch occurs beyond the period covered by this AO, NASA reserves the right to not select ISS flight investigations. In this case, NASA intends to offer ISS opportunities in subsequent Explorer AO's.

3.5 Management Requirements

3.5.1 General Policies

Explorer mission investigation teams must be led by a single Principal Investigator who may be from any category of U.S. or non-U.S. organization, including educational institutions; industry or nonprofit institutions; or from one of the NASA Centers, the Jet Propulsion Laboratory (JPL), other Federally-funded research and development centers, or other U. S. Government agencies. Teams may be formed from any combination of these institutions. Note that the level of detail required in the proposal (and the Phase A concept study report) is the same regardless of what organizations are partners in the investigation team, even a NASA center.

The Principal Investigator is in charge of his/her investigation, with full responsibility for not only its scientific integrity, but its implementation as well, from development of the proposal through all phases of the investigation. NASA intends to allow the Principal Investigator and his/her team to use their own management processes, procedures, and methods to the fullest extent possible. Investigation teams shall define the management approach best suited for their particular teaming arrangement. This approach shall be commensurate with the investigation's implementation approach, while retaining a simple and effective management structure necessary to assure the adequate control of development within the cost and schedule constraints. The investigation team should develop a Work Breakdown Structure (WBS) that best fits its organizational approach and mission design concept.

Each investigation must define the risk management approach it intends to use to ensure successful achievement of the mission objectives within established resource and schedule constraints. Included in this discussion of risk management must be risk mitigation plans for any new technologies and the need for any long-lead items that need to be placed on a contract before the start of the development phase, to ensure timely delivery. In addition, any manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation should be identified. The proposer must describe the approach for managing risk which will mitigate loss of the mission or serious degradation due to errors by human operators or errors or malfunctions in the mission data systems during the flight phase.

Each selected investigation must have a Project Manager (PM), selected by the PI, who will oversee the technical implementation of the investigation. The role, qualifications, and experience of the PM must be adequate to ensure that the technical and managerial needs of the investigation will be met.

For SMEX missions, if project management and end-to-end systems engineering are to be implemented from a NASA Center, then these functions must be performed by either NASA's Jet Propulsion Laboratory (JPL) or NASA's Goddard Space Flight Center (GSFC).

Finally, the PI is accountable to NASA for the scientific success of the investigation. Therefore, the PI must be prepared to recommend mission termination if, in his/her judgment, the successful achievement of established science objectives, as defined in the proposal, is no longer likely within the committed cost and schedule reserves.

3.5.2 Co-Investigator Roles and Requirements

A Co-Investigator is defined to be an investigator who plays a necessary role in the proposed investigation and whose services are either funded by NASA or are contributed. If funded by NASA, costs must be accounted for in the NASA OSS Cost. If contributed, the costs must be accounted for in the Total Cost and an endorsement letter from the proposed Co-Investigator's institution must be provided with the proposal. The role of each Co-Investigator must be described in the proposal. Other nonfunded members of the proposal team may be included in the proposal as collaborators. See Appendix B for details.

3.6 Cost Requirements

3.6.1 Full Cost Accounting

Where NASA-provided services are used, NASA Civil Service labor and supporting NASA Center infrastructure must be costed on a full cost accounting basis. If NASA guidance for full cost accounting has not been fully developed by the closing date for proposal submission or completion of the concept study, NASA Centers may submit full cost proposals based on the instructions in the NASA Financial Management Manual, Section 9091-5, Cost Principles for Reimbursable Agreements, or based on their own Center-approved full cost accounting models. If any NASA costs are to be considered as contributed costs, the contributed item(s) or service must be separately funded by an effort complementary to the proposed investigation and the funding sources must be identified. Other Federal Government elements of proposals must follow their agency cost accounting standards for full cost. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

3.6.2 Goods and/or Services Offered on a No Exchange of Funds Basis

Contributions of any kind, whether cash or noncash (property and services), to Explorer investigations by organizations other than the Office of Space Science are welcome. Values for all contributions of property and services shall be established in accordance with applicable cost principles. Such contributions may be applied to any part or parts of a mission. For all U.S. components of proposals, letters of endorsement must be submitted with the proposal from both the organization providing any contributed property or service and the organization providing any required funding. A letter of endorsement must provide evidence that the institution and/or Government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA . For non-U.S. components of proposals, see Section 3.7.

The cost of contributed hardware or software must be estimated as either: (1) the cost associated with the development and production of the item, if this is the first time the item has been developed and if the mission represents the primary application for which the item was developed; or (2) the total of any recurring and mission-unique costs associated with reproduction and/or modification of the item if this is not a first-time development. If an item is being developed primarily for an application other than the one in which it will be used in the proposed investigation, then it may be considered as falling into the second category (with the estimated cost calculated as that associated with the reproduction and modification alone).

The cost of contributed labor and services must be consistent with rates paid for similar work in the offeror's organization. The cost of contributions does not need to include funding spent before the start of the investigation (before completing a contract or grant with NASA). The value of contributed materials and supplies shall be reasonable and shall not exceed the fair market value of the property at the time of the contribution.

3.6.3 NASA OSS Cost

The NASA OSS Cost is the funding that NASA OSS would be expected to provide to the investigation team over the course of the investigation, beginning with selection and ending with the conclusion of Phase E. Examples of costs to be included are launch services including any upper stages; education and public outreach activities; new technology; subcontracting costs (including fees); science teams; all personnel required to conduct the investigation, analyze and publish results, and deliver data in archival format; insurance; ground data system including mission and data services provided by NASA's Space Communication and Data Systems (SCDS), if required (see *NASA's Mission Operations and Communications Services* document in the Explorer Program Library); labor (contractor); noncontributed NASA civil servant costs; reserves; and contract fees. The specific total funding limits and limits for major mission elements are specified in Sections 4.4 and 5.5. The NASA OSS Cost is a consideration in the selection of investigations and in the continuing assessment of ongoing missions.

As noted in Section 3.3.2, costs for Phase F activities, if any of these are proposed, must be included in the estimate of NASA OSS Cost but will not count against the cost cap.

3.7 International Participation

3.7.1 General Policies

Recognizing the potential scientific, technical, and financial benefits offered to all partners by international cooperation, participation by non-U.S. individuals and organizations as team members in Explorer investigations is welcomed. Participation may include, but is not limited to, the contribution of scientific instruments, the spacecraft (or a portion thereof), and the subsequent sharing of the data from the mission, all on a no-exchange-of-funds basis. Carriers, launch vehicles and launch services, and space operations may also be contributed by international partners. Such participation

can add to management complexity and risk, however, and proposed cooperative arrangements must offer significant benefits while maintaining clear technical and management interfaces. The proposal must discuss the risks and benefits of proposed cooperative arrangements, as well as management approaches to mitigating these risks.

The direct purchase of supplies and/or services that do not constitute research from non-U.S. sources is permitted except that NASA is precluded from purchasing non-U.S. launch vehicles, nor may NASA funds provided to a mission team be used to purchase a launch vehicle from a non-U.S. source. The provision of launch services as a contribution to an Explorer mission by a non-U.S. partner is acceptable only on a no-exchange-of-funds basis (i.e., at no cost to NASA). The demonstrated reliability of the proposed launch vehicle and the resultant probability of mission success will be considered by NASA in the evaluation of risk. Information on the reliability of ELV's may be obtained from the point of contact listed in the *Expendable Launch Vehicle Opportunities* document in the Explorer Program Library (Appendix C).

Proposers are advised that a contract or subcontract by a U.S. team with a non-U.S. participant using funds derived from NASA must meet all applicable NASA and Federal regulations. Proposers are further advised that these regulations will place additional requirements on investigation teams that must be explicitly included in discussions of the investigation's cost, schedule, and risk management.

3.7.2 Proposal Preparation and Submission

Non-U.S. proposals must be submitted in English and comply with all other submission requirements stated in the AO. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. and must be received before the established closing date. All proposals received after the closing date will be treated in accordance with NASA's provisions for late proposals (Appendix A, Section VII). Proposals from foreign entities that include U.S. participation and proposals from U.S. entities that include foreign participation must include a cost plan for the U.S. entities, and, at a minimum, the integrated value of the contribution of each foreign entity. See also Section 4.3 for further guidance for SMEX proposal preparation.

3.7.3 Letters of Endorsement

Participation by non-U.S. individuals and/or institutions as team members or as contributors to Explorer investigations must be endorsed by the institutions and governments involved. If government funding or support is required, then a government endorsement is also required. The letter of endorsement must provide evidence that the non-U.S. institution and/or government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA. Such endorsements must be submitted per the schedule in Section 1.3. In exceptional cases, proposals containing a foreign component can be submitted without endorsement if the endorsement is not possible before the announced closing date. In such cases, the proposal should indicate when a decision on endorsement can be expected.

3.7.4 U.S. Export Laws and Regulations

Proposers should be aware that investigations selected for Phase A that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include in their proposal a section discussing compliance with U.S. export laws and regulations; e.g., 22 CFR 120-130, *et seq*. and 15 CFR 730-774, *et seq*., as applicable to the scenario surrounding the particular international participation (see Appendix B.I.4). Proposers must also comply with NASA FAR Supplement clause 1852.225-70 entitled "Export Licenses." The proposal must describe in detail the proposed international participation and is to include, but not be limited to, whether or not the international participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, the Phase A Concept Study Report must discuss whether the license has been applied for or, if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at the World Wide Web addresses http://www.pmdtc.org/ and http://www.bxa.doc.gov/. Prospective proposers are advised that under U.S. law and regulation, spacecraft and their specifically designed, modified, or configured systems; components; parts; etc., such as the instrumentation being sought under this AO, are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR 120-130, *et seq*.

3.7.5 Agreements with Selected Non-U.S. Participants

Should a non-U.S. proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the foreign sponsor will each bear the cost of discharging their respective responsibilities.

It is the policy of NASA to establish formal international agreements with foreign partners in cooperation on flight missions. For major contributions, either by a foreign partner to a U.S. program or by a NASA-funded party to a foreign-led program, these agreements will be either a Memorandum of Understanding (MOU) or an implementing agreement under a framework agreement. Examples of major contributions are provision of an entire instrument, a launch, or a major spacecraft subsystem.

For less significant exchanges, the agreement for the entire cooperation may take the form of a Letter of Agreement (LOA). Alternatively, for some major exchanges that will eventually be covered by a MOU or implementing agreement, it may be necessary to establish an interim LOA that will remain in force until later entry into force of the MOU or implementing agreement. A common example of the latter situation would be a study phase award that entails only a minor U.S. Government financial commitment but requires the legal and/or export control framework provided by a formal international agreement.

For those cooperative contributions that will entail execution of a LOA (in lieu of a MOU) for either reason, the sponsoring foreign entity's letter of endorsement to support (if selected) the proposed foreign contribution must contain either (1) a clear statement that the sponsoring foreign entity is legally empowered to bind its own national government or (2) advance agreement that any LOA's required will be governed by U.S. law.

In the event that a non-U.S. proposal is selected, NASA will contract with a U.S. lead entity for performance of the U.S.-funded elements of the investigation.

Whether an agreement is required during the concept study phase must be determined on a case-by-case basis. Due to the short duration of the concept study phase, it may not be possible for NASA to conclude an international agreement prior to the due date for concept study reports. Proposals must show how the Phase A concept study can be completed in the absence of an international agreement.

3.8 Education and Public Outreach Requirements

OSS expects education and public outreach (E/PO) to be a significant part of each OSS flight program and research discipline, and strongly encourages space science researchers to engage actively in education and public outreach as an important component of their NASA-supported professional activities. In order to achieve this goal, OSS has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education) and the enhancement of public understanding of space science integral parts of all of its missions and research programs. The three key documents that establish the basic policies and guide all OSS E/PO activities are a strategic plan entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), an accompanying implementation plan entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996), and the *Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria* (February 2002). These documents are available through the Explorer Program Library (see Appendix C) or, alternatively, can be accessed by selecting "Education and Public Outreach" from the menu on the OSS homepage at the World Wide Web address http://spacescience.nasa.gov/, or may be requested from Rosalyn A. Pertzborn, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001, U.S.A. As a consequence of the policies adopted by OSS, a major, national space science E/PO outreach program is now underway. Information on this program may be found in the *OSS FY 2001 E/PO Annual Report*, which is included in the Explorer Program Library.

In accord with these established OSS policies, E/PO will be an integral element of the Explorer Program, and 1-2% of the total program budget (excluding launch vehicles) will be allocated to education and outreach. Also note that this AO's goal for the involvement of small disadvantaged businesses and minority institutions (see Section 3.9.2) may be met through an appropriately planned E/PO program.

Instructions for the E/PO component of the proposal are contained in Appendix B. A detailed E/PO implementation plan will be developed by each selected investigation as part of its Phase A concept study. As outlined in Section 7.4.4, plans for E/PO will play an explicit role in the evaluation of the concept studies and in the downselection of investigations. See the *Guidelines and Criteria for the Phase A Concept Study* document in the Explorer Program Library for additional information.

3.9 Advanced Technology and Small Disadvantaged Business and Minority Institution Requirements

3.9.1 Advanced Technology

NASA seeks to infuse new technologies that enhance performance and reduce costs into its programs and to strengthen the mechanisms by which it transfers such technologies to the private sector, including the nonaerospace sector. The means by which NASA's Office of Space Science plans to implement new technology is described in *The Space Science Enterprise Integrated Technology Strategy* (October 1998), which is included in the Explorer Program Library (see Appendix C). Explorer investigations present an opportunity to develop and test new technologies and applications that enhance the investigation's science return and/or reduce its cost. Investigations dependent on new technology will not be penalized for risk provided that adequate plans are described to provide a reasonable back-up approach that will assure the success of the investigation.

Instructions for the advanced technology component of the proposal are contained in Appendix B. A detailed advanced technology infusion and transfer implementation plan will be developed by each selected investigation as part of its Phase A concept study. As outlined in Section 7.4.4, plans for advanced technology will play an explicit role in the evaluation of the concept studies and in the downselection of investigations. See the document, *Guidelines and Criteria for the Phase A Concept Study*, in the Explorer Program Library for further information.

3.9.2 Small Disadvantaged Businesses and Minority Institutions

The PI and team members shall agree to use their best efforts to assist NASA in achieving its goal for the participation of small disadvantaged businesses (SDB's), women-owned small businesses (WOSB's), historically black colleges and universities (HBCU's), and other minority institutions in NASA procurements. Investment in these organizations reflects NASA's commitment to increase the participation of minority concerns in the aerospace community and is to be viewed as an investment in our future. Note that the substantial element of minority colleges and universities in space science missions and research programs is also a key objective of the OSS E/PO program. Offerors, other than small business concerns, are also advised that contracts resulting from this AO will be required to contain a subcontracting plan that includes goals for subcontracting with small, small disadvantaged, and WOSB concerns. See Appendix A, Section XIII for information on goals and subcontracting plan requirements.

Instructions for the SDB's and minority institutions component of the proposal are contained in Appendix B. A detailed implementation plan will be developed by each selected investigation as part of its Phase A concept study. As outlined in Section 7.4.4, participation goals and the quality and level of work performed by SDB's and minority institutions will play an explicit role in the evaluation of the concept studies and in the downselection of investigations. See the document, *Guidelines and Criteria for the Phase A Concept Study,* in the Explorer Program Library for further information.

4.0 SMEX OPTIONS, GUIDELINES, AND REQUIREMENTS

4.1 SMEX Requirements

A SMEX proposal must be for a science investigation whose implementation requires a complete, free-flying space mission or whose implementation is an attached payload for the International Space Station. The Principal Investigator is responsible to NASA not only for the scientific integrity of the investigation, but also for the management of the complete mission, including provision of the spacecraft, instrument, and ground system. Such missions are released as free flying spacecraft from expendable launch vehicles or are delivered to the International Space Station on the Space Shuttle.

4.2 SMEX Options

4.2.1 Expendable Launch Vehicle Option

Under this option, SMEX investigations are launched using expendable launch vehicles (ELV's) either as primary, secondary, or co-manifested payloads. NASA-provided ELV launch options available through this AO include launch services on a Small Expendable Launch Vehicle Kennedy Space Center (SELV KSC) or those offered under the NASA Launch Services (NLS) contract. The *Expendable Launch Vehicle Opportunities* document in the Explorer Program Library (Appendix C) provides information on specific ELV opportunities.

Other options that may be proposed are as a secondary or co-manifested payload on commercial missions and larger ELV's such as a Delta II or Atlas Centaur (IIA or IIAS) using a NASA-approved launch service provider. NASA seeks to take advantage of all reasonable sources of commercial ELV services while assuring that NASA-funded payloads are not exposed to excessive risk. The demonstrated reliability of the proposed launch vehicle and the resultant probability of mission success will be considered by NASA in the evaluation of risk. Information on the reliability of ELV's may be obtained from the point of contact listed in the *Expendable Launch Vehicle Opportunities* document in the Explorer Program Library. If the proposed launch opportunity is a secondary or co-manifested payload on an ELV, the proposer must identify the opportunity and provide evidence that the launch service provider is aware of the launch requirement, is supportive, and will pursue manifesting the investigation. If the investigation is selected for a Phase A, the proposer must provide evidence as part of the concept study report that the launch service provider agrees to manifest the investigation.

If the investigation is selected for flight, NASA expects to contract with the U.S. launch service provider to acquire the launch service for the investigation.

It is the responsibility of the proposer to find an organization that will contribute a launch if a contributed launch is part of the proposed investigation. The demonstrated reliability and the resultant probability of mission success will be evaluated as described above for both contributed launch services and NASA OSS-funded launch services. The use of non-U.S. provided launch services may be proposed only on a no-exchange-of-funds basis.

4.2.2 International Space Station Attached Payload Option

Under this option, a SMEX investigation may be proposed to fly on the International Space Station (ISS) as a full truss site payload only. All other opportunities for ISS payloads are covered under the Missions of Opportunity in Section 5.0. Only investigations that cannot be accommodated on other standard ISS sites may be proposed for a full truss site. The accommodation capabilities of each site are described in the *International Space Station Research Opportunities* document in the Explorer Program Library (Appendix C). Safety requirements for manned flight may also be found in the Explorer Program Library. Requirements for proposals utilizing the ISS are given in Section 3.4.5.

All ISS payloads will be launched on the Space Shuttle, but do not require a primary or secondary payload classification designation. Manifesting is the responsibility of the GSFC ISS Research Program Office and will be handled through the ISS Program Office. The PI is responsible for working manifest, safety, and other issues with the point of contact(s) identified in the *International Space Station Research Opportunities* document in the Explorer Program Library.

4.3 International Participation

Any proposed international participation must be described at the same level of detail as that of U.S. partners. This includes the provision of cost, schedule, and management data. Failure to document cost and schedule data, management approaches, or failure to document the commitment of team members or funding agencies, may cause a proposal to be found unacceptable.

4.4 Cost and Schedule Requirements

4.4.1 Schedule Requirements and Constraints

The SMEX program is part of an effort to develop frequent space science investigations of modest scope. The schedule for investigations selected through this AO is expected to be such that launch can take place by February 2007 for the first mission and February 2008 for the second mission. The proposer must specify the launch date in the proposal. It may be necessary for NASA to adjust the launch dates of the selected missions from those proposed to conform to the available Explorer program budget profile; therefore,

the degree of launch date flexibility must also be indicated in the proposal. Procurement of long lead materials is permitted during the Phase B/C time frame but must be defined in the concept study. No time constraint is placed on Phase E.

Due to additional schedule constraints placed on full truss site ISS payloads by the ISS assembly sequence and site occupancy, ISS payloads are exempted from the launch date requirement. ISS full truss site payloads must have a launch readiness date of February 2007. The proposal must address how the impact of launch delays beyond the proposer's control will be managed within the proposed cost cap for the mission.

4.4.2 NASA OSS Cost

For a SMEX, the NASA OSS Cost is limited to $100 million in Fiscal Year 2003 dollars, including funding for all phases and all elements (e.g., launch services, any GFE, Phase A through Phase E, implementation of the E/PO program, mission operations and data analysis, safety reliability and quality assurance activities, and reserves). The proposer may distribute the funds among these elements as best suits the investigation.

Although NASA plans to fund directly the costs for any U.S. launch services, these costs are nonetheless to be included in the proposal. The ELV launch services cost to be used to calculate the NASA OSS Cost for an investigation using an ELV is provided in the *Expendable Launch Vehicles Opportunities* document available in the Explorer Program Library. Launch services may also be proposed at no cost to NASA as part of a teaming proposal.

For the purpose of this AO, NASA OSS Costs include funding to be used for all SCDS services such as mission operations, DSN tracking, and communication lines.

As noted in Section 3.3.2, costs for Phase F activities, if any of these are proposed, must be included in the estimate of NASA OSS Cost but will not count against the cost cap.

The specific cost information required for SMEX proposals is contained in Appendix B.

4.4.3 Total Mission Cost including Contributions

The Total Mission Cost is defined as <u>all</u> costs that are necessary to complete an investigation beginning with selection through Phase E, including NASA OSS Costs, non-NASA Civil Servant costs, and contributions from U.S. (including non-NASA OSS) and non-U.S. entities. In general, proposers should assume all costs must be included unless specifically excluded. Proposers must estimate the Total Mission Cost in the proposal as described in Appendix B, Table B4.

Contributions, that is, goods and/or services offered on a no-exchange-of-funds basis, may be proposed to any mission element but the total contribution is not to exceed one-third of the NASA OSS Cost.

4.5 Selection and Cost Limits

It is anticipated that up to four SMEX investigations will be selected for a five-month Phase A concept study through this AO, with each awarded a contract with a priced option for a two-month bridge phase (see Section 7.4.2). At the conclusion of the concept study, it is planned that two investigations will be selected to proceed into subsequent mission phases. NASA will not exercise contract options nor continue funding for those investigations not selected to proceed. Those investigations not selected to proceed may propose to future Explorer AO's with neither prejudice nor advantage on the part of NASA.

A concept study will be conducted by each selected investigation team. The cost (up to $500K in real year dollars) of the concept study must be part of the proposal and is included in the NASA OSS cost cap. See the *Guidelines and Criteria for the Phase A Concept Study* document available in the Explorer Program Library (Appendix C) for information on the concept study to be conducted by the investigation team.

During Phase A, the NASA OSS Cost shall not increase by more that 20% from that offered in the original proposal and must not exceed the NASA cost cap given in Section 4.4.2. Thereafter, the NASA OSS Cost shall not increase from that offered in the proposal resulting from the Phase A concept study.

Each mission's concept study must conclude with a commitment by the PI for the cost, schedule, and scientific performance of the investigation. If, at any time, the cost, schedule, or scientific performance commitments appear to be in peril, the investigation will be subject to cancellation. The Explorer program does not maintain a budget reserve to which investigations exceeding their cost commitments may have access for cost overruns.

At the investigation's Phase B/C Confirmation Review (see Section 7.4.5), the PI will be required to demonstrate a minimum cost reserve of 20%, or to justify a cost reserve of less than 20%, against the cost to complete (not including the launch vehicle or MO&DA).

4.6 Baseline and Minimum Missions

SMEX missions proposed in response to this AO must have both a proposed Baseline Mission and a proposed Minimum Mission. The proposed Baseline Mission refers to that mission that, if fully implemented, will accomplish the entire set of scientific objectives identified for the mission in the proposal. The proposed Minimum Mission is the minimum science component identified for the mission in the proposal below which the investigation will not be considered justifiable for the proposed cost. The differences between the proposed Baseline Mission and the proposed Minimum Mission will be assessed in order to determine the mission's resiliency in the event that development problems lead to reductions in scope. In developing the proposed Minimum Mission, the proposer must consider all aspects of the mission (e.g., launch vehicle, instrument,

spacecraft, ground system) and not focus entirely on possible instrument descopes or shorter mission operations.

Any alteration of the mission that results in a reduction of the mission's ability to accomplish the Baseline Mission set of scientific objectives as identified in the Concept Study Report at the end of Phase A will be considered a "descoping" of the mission. The resulting set of achievable scientific objectives must be reviewed to ensure that the mission remains at or above the Minimum Mission.

A plan for the prioritized descoping of mission capability from the Baseline Mission to the Minimum Mission in the event of cost or schedule growth shall be developed during Phase A. The mission team will also negotiate a set of performance metrics during Phase A for program evaluation, including cost, schedule, and others as appropriate. Failure to maintain a level of science return at or above the Minimum Mission or violation of the agreed upon metrics will result in the mission being reviewed for possible termination.

5.0 MISSIONS OF OPPORTUNITY BACKGROUND, CONSTRAINTS, GUIDELINES, AND REQUIREMENTS

5.1 Missions of Opportunity Background and Constraints

By soliciting Mission of Opportunity proposals, NASA seeks to allow the scientific community the opportunity to conduct a science investigation of interest to OSS as part of a non-OSS space mission (see Section 5.2), through flight on a long duration balloon (see Section 5.3), or on the International Space Station (see Section 5.4).

A selected investigation may result in a contract or a grant, depending on the nature of the proposal and the institutions involved. Further information on grants is contained in NPG 5800.1E, *Grant and Cooperative Agreement Handbook*, available from the Explorer Program Library (see Appendix C).

A Mission of Opportunity may be selected for flight without first completing a Phase A concept study, or it may be required to conduct a Phase A concept study before being considered for flight. If required, a selected Mission of Opportunity investigation will submit a concept study report to NASA OSS for detailed review. Concept studies are expected to address plans for E/PO and for meeting other programmatic objectives of this AO. This report will conclude with a commitment by the PI for the cost, schedule, and scientific performance of the investigation. If, at any time, this commitment appears to be in peril, the investigation will be subject to cancellation regardless of the impact of this cancellation on its "parent" mission. Like other missions proposed to this AO, NASA OSS funding is subject to cancellation if there is a cost overrun charged to NASA for any reason, including a launch delay caused by the non-NASA OSS partner.

A technical and programmatic review will be held prior to the start of Phase C/D. Assuming a positive outcome, NASA will confirm the investigation to proceed to development. As a condition for confirmation of a Mission of Opportunity that is part of a non-OSS space mission, the organization sponsoring the full mission must make a

commitment to enter into an appropriate agreement with NASA OSS that shall include provisions for sharing of flight data necessary for the completion of the selected Mission of Opportunity investigation (see Section 5.2 below).

NASA provided expendable launch vehicles are not offered for Mission of Opportunity investigations. With the exception of International Space Station payloads, Space Shuttle launches are not offered for Mission of Opportunity investigations.

5.2 Classic Missions of Opportunity

For purpose of this AO, a classic Mission of Opportunity is one in which the proposer offers to participate in a non-OSS space mission that is planned or that has been approved by its sponsoring organization. By funding U.S. participation in a non-OSS space mission, NASA seeks to allow the scientific community to conduct a science investigation of interest to OSS as part of a non-OSS space mission. Such missions may be sponsored by non-U.S. governments, by other U.S. agencies (including NASA), or by private sector organizations. Classic Mission of Opportunity investigations on a military satellite are allowed as long as the satellite is not planned for weapons testing.

Participation in a non-OSS space mission could take many forms, such as providing a complete science instrument, hardware components of a science instrument, expertise in critical areas of the mission, or purchase of data from the mission. If the provision of hardware is proposed, then that hardware must be either components of a science instrument or a complete science instrument. NASA OSS will evaluate the proposed science investigation and not the sponsor's entire mission. While the investigator is not required to document the entire mission of the sponsor, the U.S. investigator must fully document their complete investigation in the proposal.

Note that selection by NASA OSS through this AO does not constitute selection of a classic Mission of Opportunity investigation as part of the non-OSS mission, which necessarily is a decision made by the sponsor of the mission. Instead, selection is a commitment by NASA OSS to fund the NASA OSS portion of the investigation as part of the Explorer program, although funding beyond basic studies will not begin until detailed design of the mission itself is underway. If a classic Mission of Opportunity investigation is selected both by NASA OSS and by the mission sponsor, the PI is responsible to NASA OSS for the scientific integrity and the management of the PI's contribution to the mission.

The proposing investigator must provide evidence that the sponsoring organization intends to fund the primary host mission and that the endorsement by NASA for U.S. participation is required by the sponsoring organization prior to December 31, 2005. The launch date itself is not constrained. If a commitment from NASA is not needed by the sponsoring organization before December 31, 2005, then the proposal must be submitted to a subsequent Explorer program AO.

Classic Missions of Opportunity are generally conducted on a no-exchange-of-funds basis between NASA OSS and mission sponsors. They are always conducted on a no-exchange-of-funds basis with a non-U.S. mission sponsor.

Classic Mission of Opportunity investigation teams will have data analysis responsibilities primarily defined by the policies of the host mission sponsor; nevertheless, NASA OSS expects that the mission sponsor will enter into an agreement with NASA OSS to assure that data returned from at least those aspects of the mission in which NASA OSS support is involved, if not the entire mission, will be made available to the U.S. scientific community in a timely way.

5.3 Long Duration Balloon Missions as Missions of Opportunity

Under this AO, a long duration balloon (LDB) may be proposed as the launch vehicle for an Explorer investigation. For this AO, a LDB flight is defined as a balloon flight lasting more than one week. LDB missions are Missions of Opportunity in the sense that (i) NASA may or may not select one or more LDB missions, and (ii) the cost cap for LDB missions is the Mission of Opportunity cost cap. In all other regards, the proposal requirements for a LDB Explorer mission proposal are the same as for a SMEX proposal. In particular, although foreign participation is allowed in LDB missions, none is required.

A complete mission using LDB's may include more than one flight as long as the first flight is no later than February 2008 and the total investigation is executed within the Mission of Opportunity cost cap. See the *Long Duration Balloon Opportunities* document in the Explorer Program Library for additional information. Note that the ultra long duration super pressure balloon capability that is under development for large payloads is not available for this AO.

5.4 International Space Station Payloads as Missions of Opportunity

Under this AO, Explorer investigations of modest cost to be carried out from the International Space Station may be proposed as Missions of Opportunity. ISS missions are Missions of Opportunity in the sense that (i) NASA may or may not select one or more ISS missions, and (ii) the cost cap for ISS missions is the Mission of Opportunity cost cap. In all other regards, the proposal requirements for a ISS Explorer mission proposal are the same as for a SMEX proposal. In particular, although foreign participation is allowed in ISS missions, none is required. Requirements for proposals utilizing the ISS are given in Section 3.4.5.

OSS has allocations for two zenith-pointing EXPRESS (EXpedite the PRocessing of Experiments to Space Station) Pallet Adapter payloads, available beginning in 2007. Information on the specifics of the EXPRESS Pallet, including interfaces, available payload resources, costing information, and a point of contact from the OSS Research Program Office for ISS Utilization, may be found in the *International Space Station Research Opportunities* document in the Explorer Program Library (see Appendix C).

The current preliminary date for the launch of the first zenith EXPRESS Pallet and integrated payloads is no earlier than February 2007. Potential proposers must contact the point-of-contact in the *International Space Station Research Opportunities* document to learn of any significant change to this milestone. If the milestone is delayed beyond the period covered by this AO, NASA intends to offer ISS opportunities in subsequent Explorer AO's.

A Mission of Opportunity investigation may also be proposed to fly on the ISS as a full truss site payload. An investigation may only be proposed for the ISS full truss site if it cannot be accommodated on other standard ISS sites. Since only one full truss site may be available for investigations proposed to this AO, then, at most, only one full SMEX investigation (see Section 4.2.2) or one Mission of Opportunity investigation can be selected for the ISS full truss site through this AO. The accommodation capabilities of the ISS sites are described in the *International Space Station Research Opportunities* document in the Explorer Program Library (Appendix C). ISS full truss site payloads must have a launch readiness date of February 2007.

Opportunities for payloads intending to use the ISS Window Observational Research Facility (WORF) are also offered under this AO. The WORF accommodates Earth viewing observations, such as auroral observations, through the window in the U.S. laboratory. Payloads using the WORF remain within the pressurized volume of the ISS. Specific accommodation information for WORF payloads can be found in the *International Space Station Research Opportunities* document in the Explorer Program Library. The WORF itself will be placed in the ISS in 2003. Multiple payload flight opportunities exist starting in 2003.

Japanese Experiment Module – Exposed Facility (JEM-EF) payloads may also be proposed to this AO. The OSS currently has two allocations on the JEM-EF. Payloads on these sites are capable of simultaneous zenith and nadir viewing. The JEM-EF is planned for a 2006 launch with the first payload opportunities in 2006. Specific accommodation information for JEM-EF payloads can be found in the *International Space Station Research Opportunities* document in the Explorer Program Library.

Payloads for the Columbus External Payload Facility (EPF) and nonstandard payloads are not being solicited through this AO.

5.5 Cost and Schedule Requirements for Missions of Opportunity

Although the level of funding available for each proposal will be decided on a case-by-case basis, proposers should be aware that any Mission of Opportunity investigation costing the Explorer program more than $35 million in Fiscal Year 2003 dollars (including all phases of the investigation) will be difficult to support. NASA's funding for a selected investigation's concept study will be limited to $250K (in real year dollars).

For a classic Mission of Opportunity, follow-on work prior to acceptance of the investigation by the mission's sponsoring organization is limited to $100K (in real year dollars).

The limit for all studies prior to the Phase B/C confirmation and the initiation of mission detailed design (Phase C) is 25% of the total NASA commitment for Phases A/B/C/D. The PI must assume all risk for delays in the mission and must, therefore, propose appropriate reserves.

Launch services costs for long duration balloon missions may include mission-unique costs necessary to conduct the investigation. See the *Long Duration Balloon Opportunities* document in the Explorer Program Library.

For the purpose of this AO, NASA OSS Costs include funding to be used for SCDS services such as mission operations, DSN tracking, and communication lines.

As noted in Section 3.3.2, costs for Phase F activities, if any of these are proposed, must be included in the estimate of NASA OSS Cost but will not count against the cost cap.

Proposers must estimate the total NASA OSS cost in the proposal. The specific cost information required for proposals is contained in Appendix B.

For Long Duration Balloons, ISS Attached Payloads, and Data Buys, contributions, that is, goods and/or services offered on a no-exchange-of-funds basis, may be proposed to any mission element but the total contribution is not to exceed one-third of the NASA OSS cost.

During Phase A, the NASA cost shall not increase by more that 20% from that offered in the original proposal and must not exceed the NASA cost cap. Thereafter, cost shall not increase from that offered in the proposal resulting from the Phase A concept study.

Each mission's concept study must conclude with a commitment by the proposer for the cost, schedule, and scientific performance of the investigation. If, at any time, the cost, schedule, or scientific performance commitments appear to be in peril, the investigation will be subject to cancellation. The Explorer program does not maintain a budget reserve to which investigations exceeding their cost commitments may have access for cost overruns.

At the investigation's Phase B/C Confirmation Review (see Section 7.4.5), the PI will be required to demonstrate a minimum cost reserve of 20%, or to justify a cost reserve of less than 20%, against the cost to complete (not including the launch vehicle or MO&DA).

6.0 PROPOSAL PREPARATION AND SUBMISSION

6.1 Preproposal Activities

6.1.1 Explorer Program Library

The Explorer Program Library provides additional requirements and background information on the Explorer program, including science goals, technology and education/public outreach strategies, and information on management aspects of flight programs. Information on the Explorer Program Library is contained in Appendix C. The Explorer Program Library is accessible at the World Wide Web address http://explorer.larc.nasa.gov/explorer/sel.html.

6.1.2 Technical and Scientific Inquiries

All inquiries should be directed to the Explorer Program Scientist, as designated below. Inquiries are preferred in writing and may be sent by fax or E-mail; the character string "SMEX AO" (without quotes) should be included in the subject line of all transmissions.

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6.1.3 SMEX Acquisition Additional Information Web Page

A SMEX Acquisition Additional Information web page, available at the World Wide Web address http://explorer.larc.nasa.gov/explorer/smexacq.html, will provide updates during the SMEX AO solicitation process. It will provide links to the Explorer Program Library, information about the preproposal conference, a list of potential proposers (see Section 6.1.5), and responses to frequently asked questions.

6.1.4 Preproposal Conference

A preproposal conference will be held in the Washington, DC, metropolitan area. Further information, including date, location, and logistics, will be available on the SMEX Acquisition Additional Information web page at the URL given in Section 6.1.3 above, prior to the Preproposal Conference.

Participants are to attend at their own expense and to make their own travel arrangements. The purpose of this conference will be to address questions about the

proposal process for this AO, including a discussion of the evaluation criteria, procurement approach, and GFE. The preproposal conference also will address questions that are received by NASA at least one week prior to the Preproposal Conference. Questions should be addressed to the Explorer Program Scientist at the address above. Additional questions submitted after this date, including those provided in writing at the conference, may be addressed at the conference only as time permits. Anonymity of the authors of all questions will be honored. Material presented at the preproposal conference, including answers to questions submitted in advance, will be posted on the SMEX Acquisition Additional Information web page at the World Wide Web address given in Section 6.1.3. A SMEX AO Preproposal Conference Transcript, including answers to all questions addressed at the conference, will be available approximately two weeks after the conference to anyone who submits a request for this document to the Explorer Program Scientist via fax or electronic mail.

6.1.5 Notice of Intent to Propose

To assist NASA's planning of the proposal evaluation process, a Notice of Intent (NOI) to Propose should be submitted by all prospective proposers in accordance with the schedule in Section 1.3. Those submitting a NOI will directly receive program updates as may occur up to the time of proposal due date. This Notice is to be submitted electronically by entering the requested information at the World Wide Web address http://proposals.hq.nasa.gov/proposal.cfm. Proposers without access to the Web or who experience difficulty in using this site should contact the NASA Peer Review Service Help Desk at r-help@nasaprs.com for general questions and feedback or at research@hq.nasa.gov for technical questions about the web site. The Help Desk phone number is (202) 479-9376.

To the extent the following information is known by the due date, the NOI should include:

(a) Names, addresses, telephone numbers, E-mail addresses, and fax numbers of (1) the Principal Investigator; (2) any Co-Investigators; (3) any collaborators or other named participants, and (4) the lead representative from each organization (industrial, academic, educational, nonprofit, and/or Federal) expected to be included in the proposal team;

(b) Title of the proposed investigation, a brief statement of its scientific objectives, a brief description of the science implementation plans and mission design, and the primary NASA OSS science theme (see Section 1.1) that the investigation supports;

(c) Mission mode (SMEX or Mission of Opportunity); for a SMEX, the likely launch vehicle and whether a free-flyer or an ISS attached payload; for a Mission of Opportunity, whether for a LDB, the ISS, or the name of the organization sponsoring the primary host, as may apply; and

(d) Identification of any new technologies that may be employed as part of the mission.

Material in a NOI is for NASA planning purposes only, is confidential, and is not binding on the submitter.

SPECIAL NOTICE: As a result of recent AO's for complete mission investigations such as this one, commercial aerospace and technology organizations have requested access to the names and addresses of those who submit NOI's in order to facilitate informing potential proposers of their services and/or products. At the option of the submitters of a NOI, NASA OSS is willing to offer this service with the understanding that the Agency takes no responsibility for the use of such information. Therefore, all those submitting a NOI in response to this AO are requested to include the appropriately edited form of the following material (Note: this material is included in the format of the NOI on the World Wide Web):

> "By submitting this Notice of Intent to propose, I hereby do / do not authorize NASA to post my name and institutional address (but not the name of my intended proposal) as an addendum to this AO on the World Wide Web starting approximately one week after the NOI due date. If I do authorize such a posting, I understand that such information will be in the public domain, and I will not hold NASA responsible for any use made by others for revealing this information."

6.2 Format and Content of Proposals

General NASA guidance for proposals is given in Appendix A of this AO, which is considered binding unless specifically amended in this AO. A uniform proposal format is required from all proposers to aid in proposal evaluation. The required proposal format and contents are summarized in Appendix B. Failure to follow Appendix B may result in reduced ratings during the evaluation process or, in extreme cases, could lead to rejection of the proposal without review.

6.3 Submission Information

6.3.1 Certifications and Endorsements

All proposals must have a Cover Page and Proposal Summary that is to be submitted electronically through the Web site given in Appendix B. Once the form is submitted, it must be printed and used to obtain the required Principal Investigator and institutional signatures. The Cover Page must be signed by an official of the PI's institution authorized to certify institutional support and sponsorship of the investigation, and the management and the financial parts of the proposal. The proposal shall include a letter of endorsement signed by an institutional official from each known partner and each organization expecting to provide critical, no-exchange-of-funds contributions of hardware, software, facilities, services (including Co-Investigator services), etc., that provides evidence that the institution and/or government officials are aware and supportive of the investigation and will pursue funding if selected by NASA (See Appendix B, Section I.1, for additional instructions on letters of endorsement). Paper

copies of proposals and the original, signed version must be received by the due dates specified in Section 1.3 of this AO.

Non-U.S. organizations must additionally submit any such endorsements that are not included with the proposal to:

SMEX Program Support
Office of Space Science
NASA Peer Review Services
500 E Street, SW, Suite 200
Washington DC 20024-2760
U.S.A.

by the due date given in the schedule in Section 1.3. The endorsements can also be faxed to the attention of the SMEX AO 2003 Program at (202) 479-0511. Faxed endorsement should be marked "Attention: SMEX Program Support, Office of Space Science."

The authorizing institutional signature on the printout of the electronically submitted cover also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Appendix D. Therefore, it is not necessary to separately submit these certifications with the proposal.

6.3.2 Quantity and Media

Proposers must provide 55 copies of their proposal, plus the signed original, by the proposal deadline given in Section 1.3. It is required that the original and each paper copy of the proposal be accompanied by a compact disk (CD) containing an electronic version of the proposal in a single file to facilitate searching for specific information (a file in portable document format (PDF) with bookmarks is preferred).

6.3.3 Submittal Address

All proposals must be received at the following address by the schedule in Section 1.3:

SMEX AO 2003 Program
Office of Space Science
NASA Peer Review Services
500 E Street, SW, Suite 200
Washington DC 20024 -2760
U.S.A.
Tel: (202) 479-9030

6.3.4 Deadline

All proposals must be received at the address above by the closing date specified in Section 1.3. All proposals received after the closing date will be treated in accordance with NASA's provisions for late proposals (Appendix A, Section VII).

6.3.5 Notification of Receipt

NASA will notify the proposers in writing or E-mail that their proposals have been received. Proposers not receiving this confirmation within ten days after submittal of their proposals should contact the Explorer Program Scientist at the address given in Section 6.1.2.

7.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

7.1 Evaluation, Selection, and Debriefing Processes

All proposals submitted in response to this AO will be subjected to a screening to determine their compliance to the constraints, requirements, and guidelines of the AO. Before submittal, proposers should verify the compliance of their proposals using the checklist in Appendix E. Failure to comply with the requirements, constraints, and guidelines of this AO may result in the proposal being returned to the proposer without further review.

Proposals in compliance with this AO will be assessed against the criteria given in Section 7.2 by panels of individuals who are peers of the proposers. Panelists will be instructed to evaluate all proposals independently and not to compare larger investigations with smaller ones. These panels may be augmented through the solicitation of mail-in reviews as well, which the panels have the right to accept, in whole or in part, or reject. Proposers should be aware that during the evaluation and selection process, NASA may request clarification of a specific point or points in a proposal. Such a request and the proposer's response shall be in writing.

An *Ad Hoc* Categorization Subcommittee of the Space Science Steering Committee (see below), composed wholly of Civil Servants, will convene to consider the peer review results. This Committee will categorize the proposals in accordance with procedures required by NFS Part 1872.403-1. These Categories are defined as follows:

Category I. Well conceived and scientifically and technically sound investigations pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.

Category II. Well conceived and scientifically or technically sound investigations which are recommended for acceptance, but at a lower priority than Category I.

Category III. Scientifically or technically sound investigations which require further development of an instrument or a spacecraft subsystem. Category III

investigations may be funded for development and may be reconsidered at a later time for the same or other opportunities.

Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

The results of the evaluations and categorizations will be reviewed by the Space Science Steering Committee (SSSC), which is composed wholly of NASA Civil Servants and appointed by the Associate Administrator for Space Science. The SSSC will conduct an independent assessment of the evaluation and categorization processes regarding both their compliance to established policies and practices as well as the completeness, self-consistency, and adequacy of all materials related thereto. After this review, the final evaluation and categorization results will be forwarded to the Associate Administrator for Space Science who will make the final selections in consultation with the OSS Science Selection Board.

Category III investigations are candidates for Explorer funding. NASA may select one or more investigations for further technology development under the Explorer program. Any Category III investigation selected for Explorer funding will be invited to submit a revised statement of work and a revised budget for a technology development program that addresses developmental shortcomings identified by the SMEX proposal review panel. The revised statement of work will be reviewed by NASA. However, in order to be considered for flight opportunities, any investigations selected for technology development under the Explorer program must repropose to a future Explorer Announcement of Opportunity.

Selected proposers will be notified immediately by phone and then by letter, and provided with instructions for initiating their Phase A concept study. Proposers not selected will be notified by letter and will be offered a debriefing. Such debriefings may be in person at NASA Headquarters or, if the investigation team prefers, by telephone. In the former case, NASA funds may not be used to defray travel costs by the proposer for a debriefing. In either case, along with the proposing Principal Investigator, a senior representative from the key institution(s) of a proposal may also participate in such debriefings.

7.2 Evaluation Criteria

7.2.1 Overview

The evaluation criteria below will be used to evaluate and categorize proposals as described in Section 7.1. For a classic Mission of Opportunity, the proposed investigation encompasses only the proposed contribution to the mission, not the entire mission. The evaluation criteria (which are defined more fully in the sections below) are as follows:

- Scientific merit of the proposed investigation;
- Scientific implementation merit of the proposed investigation; and
- Technical, management, and cost feasibility, including cost risk, of the proposed investigation.

The proposal categorizations, discussed in Section 7.1 above, will be based on these criteria. The first two criteria are of approximately equal weight, and the third is approximately half that of each of the first two. For Missions of Opportunity that provide no hardware, the first two criteria are of approximately equal weight and the third criterion is not evaluated.

7.2.2 Scientific Merit of the Proposed Investigation

To evaluate the intrinsic scientific merit, the goals and objectives of the proposed investigation will be assessed to determine the impact of the investigation on one or more of the OSS space science themes as identified in Section 1.1 of this AO and, additionally, on the U.S. space science program (see Section 2). This evaluation will include how well the investigation fills gaps in the understanding of space science and thereby provides for progress in one of the NASA space science themes identified in Section 1.1, and/or how well the proposed investigation may synergistically support other ongoing space science missions related to these themes sponsored by NASA or a non-U.S. space agency, and whether or not it provides ancillary benefits to the U.S. space science program. A major element in this assessment will be whether the data that are proposed to be gathered will be sufficient to complete the proposed investigation. Scientific merit will be evaluated for the baseline proposed investigation; science enhancements beyond the baseline science mission will not contribute to the assessment of the scientific merit of the proposed investigation. For SMEX investigations, the scientific value of the Minimum Science Mission will also be assessed as part of the determination of the overall scientific merit of the investigation.

7.2.3 Scientific Implementation Merit of the Proposed Investigation

Each proposed investigation will be evaluated for its scientific implementation merit and the probability of success. Scientific implementation merit will be evaluated by assessing the degree to which the proposed instrument(s) can be built using the proposed technologies and the degree to which the proposed instrument(s) can provide the necessary data, as well as the degree to which the mission will support the accomplishment of acquisition of the required data. Areas requiring critical technology development of the instrument for flight readiness shall be identified. Other major elements of this criterion include the proposed data analysis and archiving plan and the proposed plan for the timely release of the data to the public domain. Any science enhancement options (e.g., so-called Phase F activities such as an extended mission, a guest investigator program, or an archival data analysis program) will be evaluated as part of this criterion; science enhancement options will be evaluated for the selection of appropriate activities to enlarge the science impact of the mission, the potential of the selected activities to enlarge the science impact of the mission, and the appropriate costing of the selected activities. Should a new technology that represents an untested

advance in the state of the art be proposed for use, an assessment will be made of the likelihood of its success. The probability of success will be evaluated by assessing science team roles, experience, expertise, and the organizational structure of the science team and the technical risk associated with the overall mission design and/or instrument set. The role of each Co-Investigator will be evaluated for necessary contributions to the proposed investigation.

Mission of Opportunity investigations that do not include hardware (e.g., data buys) will be evaluated against all the factors above except that the commercial instrument's design will not be evaluated for its ability to provide the necessary data. It is assumed that NASA will not pay for these data unless the data, as delivered, are suitable for successful completion of the proposed investigation.

In previous Explorer AO's, "scientific implementation merit" was called "technical merit and feasibility." The evaluation factors for this criterion remain substantially unchanged.

7.2.4 Technical, Management, and Cost Feasibility, including Cost Risk, of the Proposed Investigation

The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This includes an assessment of risk of completing the investigation within the proposed cost. For SMEX space flight investigations and Missions of Opportunity utilizing LDB's or the ISS, this will also include an assessment of the likelihood of launching by the proposed launch date. Since it is recognized that teaming arrangements for implementing the mission may not be complete before the proposal closing date, proposers will not be penalized if the proposal indicates only candidate (but credible) implementation approaches for the spacecraft, launch vehicle, communications, and ground systems that should reasonably allow successful implementation of the mission. Mission resiliency (the flexibility to recover from problems) will also be evaluated. For SMEX missions, this will include an assessment of the approach to descoping the Baseline Mission to the Minimum Mission in the event that development problems force reductions in scope. Proposed ISS investigations will be evaluated for the appropriate and efficient use of ISS resources.

Since classic Mission of Opportunity investigations fly on non-OSS missions, factors involving spacecraft and launch vehicle capabilities will be considered in the evaluation only as appropriate. Mission of Opportunity investigations that provide no hardware (e.g., data buys) are not evaluated under this criterion.

In previous Explorer AO's, "technical, management, and cost feasibility, including cost risk" was called "feasibility of the proposed approach for mission implementation, including cost risk." The evaluation factors for this criterion remain substantially unchanged.

7.3 Selection Factors

As described in Section 7.1, the results of the proposal evaluations based on the criteria above and categorizations will be considered in the selection process. In addition, the proposed cost to NASA OSS will also be considered in the final selections. For selection, the three criteria given in Section 7.2 and the proposed cost all have approximately equal weights.

Proposers to this AO should recognize that the program of the Office of Space Science is an evolving activity that critically depends upon Administration policies and budgets, as well as Space Science objectives and priorities, any of which may change quickly. Therefore, it is incumbent upon the Associate Administrator for Space Science to use all relevant science planning, policy, programmatic, risk, and cost considerations when making selection(s) among top ranked proposals submitted in response to this AO. In addition, proposers to this AO are advised that it is an objective, but not a requirement, that the final selections reflect a balance among the applicable scientific themes listed in Section 1.1 of this AO within the context of other approved OSS missions.

7.4 Implementation Activities

7.4.1 Notification of Selection

Following selection, the PI's of the selected investigations will be notified immediately by telephone, followed by formal written notification. The formal notification may include special instructions for the concept study. A Project Initiation Conference will be held as soon as possible after selection to clarify requirements and responsibilities of all parties having roles in the mission, including launch service personnel. Proposers of investigations that were not selected will be notified in writing and offered a debriefing as described in Section 7.1.

7.4.2 Award Administration and Funding

It is anticipated that fixed priced contracts will be awarded for Phase A concept studies for up to four SMEX investigations selected under this AO. One or more Missions of Opportunity may also be selected for Phase A concept studies or for flight. Each contract resulting from this selection will contain a priced option for a bridge phase, to be exercised upon investigations selected to proceed into Phase B/C/D. Each contract will also contain a cost option for Phase B/C/D and E activities. The bridge phase is intended to cover a two month period of Phase B effort to provide program continuity while the Phase B/C/D and E negotiations are completed and the cost option of the contract is finalized.

7.4.3 Phase A Concept Study

The concept studies are intended to provide NASA with more definitive information regarding the cost, risk, and feasibility of the investigations, as well as a detailed plan for the conduct of an appropriate education and outreach program before final selection for

implementation. The product of the concept studies will be reports to be delivered by each selected investigation team five months after the Project Initiation Conference. The content and format of the study reports are specified in the *Guidelines and Criteria for the Phase A Concept Study* document in the Explorer Program Library (Appendix C). The NASA review of the completed concept study report will include all mission facets including E/PO. NASA may request presentations and/or site visits to review the final concept study results with the investigators.

7.4.4 Downselection of Investigations

The downselection will be made by the Associate Administrator for Space Science based upon NASA review of the Phase A concept study results and programmatic considerations. The criteria for evaluating the concept study are as follows:

- Scientific merit of the proposed investigation
- Scientific implementation merit of the proposed investigation
- Technical, management, and cost feasibility, including cost risk, of the proposed investigation
- Quality of plans for education and public outreach
- Quality of plans for advanced technology infusion and transfer
- Quality of subcontracting plans for small disadvantaged business activities and minority institutions.

The criteria for downselection are described in the *Guidelines and Criteria for the Phase A Concept Study* document in the Explorer Program Library. Any changes to science and the science implementation scheme contained in the Phase A Concept Study Report will be carefully evaluated. Assuming no changes to the first two criteria, the emphasis for downselection will be on the latter four.

The Phase A Concept Study Report will include detailed information on the relevant experience and past performance of the major partner organizations over the last 5 years. NASA will also use information from other sources, such as the NASA Past Performance Database, to evaluate the likelihood that technical, schedule, and cost requirements will be met.

As a result of evaluation of the concept studies, NASA expects to downselect to two SMEX investigations to proceed by exercising their bridge phase options. Any selected Mission of Opportunity may also be authorized to proceed. In no case, however, is NASA required to exercise any option. NASA will not exercise the contract option nor continue funding those investigations not selected to proceed.

The overriding consideration for the final selection of proposals submitted in response to this AO will be to maximize scientific return within the available budget. Depending on the availability of proposals of appropriate merit, this objective may be achieved by the selection of two investigations each at the cost ceiling for SMEX investigations, or any combination of investigations of various costs.

Proposers should note that the definition phase for any investigation chosen as a second SMEX mission (launch by February 2008) will proceed at a lower level for a period of time, to conform to the available Explorer program budget profile.

Should a non-U.S. proposal or a U.S. proposal with non-U.S. participation be selected, NASA's International Space Science and Aeronautics Division will arrange with the non-U.S. sponsoring agency for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail a letter of notification by NASA with a subsequent exchange of letters between NASA and the sponsoring governmental agency or a formal Agency-to-Agency Memorandum of Understanding (MOU).

7.4.5 Confirmation of Investigations

During the Phase B/C timeframe, NASA will conduct an independent review of the investigation's readiness to proceed before being authorized to spend more than 25 percent of the total NASA commitment for Phases A/B/C/D, excluding launch services costs. Results of this Confirmation Review and a decision to proceed (or not) will be rendered within 30 days of the review. This decision will be based upon review of all aspects of the Phase B results (including education and outreach), and evidence of satisfactory technical, cost, and schedule performance including demonstration of a 20% cost reserve against the cost to complete. In addition, for any Mission of Opportunity, a commitment from the organization sponsoring the full mission to enter into an appropriate agreement with NASA is required.

8.0 CONCLUSION

The Explorer program continues to represent an extraordinarily productive program that enables NASA to accomplish important space science exploration, as well as to generate opportunities to enhance education and to engage the public in the excitement of science discoveries. NASA invites both the U.S. and international space science communities to participate in proposals for SMEX and Missions of Opportunity investigations to be carried out as a result of this Announcement.

Richard R. Fisher
Director
Sun-Earth Connection Division
Office of Space Science

Colleen Hartman
Director
Solar System Exploration Division
Office of Space Science

Anne L. Kinney
Director
Astronomy and Physics Division
Office of Space Science

Guenter R. Riegler
Executive Director for Science
Office of Space Science

Edward J. Weiler
Associate Administrator
Office of Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation, or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use of Government instrumentation or property that subsequently becomes available, with or without modification, that meets the investigative objectives.

NOTICE TO ALL OFFERORS: In the event that a Principal Investigator employed by NASA is selected under this Announcement of Opportunity (AO), NASA will award prime contracts to non-Government participants, including co-investigators, hardware fabricators, and service providers, who are named members of the proposing team, as long as the selecting official specifically designates the participant(s) in the selection decision. Refer to Section G of Appendix B of this AO for proposal information which the selecting official will review in determining whether to incorporate a non-Government participant in the selection decision. Each NASA contract with a team member selected in this manner will be supported by an appropriate justification for other than full and open competition, as necessary.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment and to discontinue the investigative effort at the completion of any phase. NASA may desire to select only a portion of the proposed investigation and/or that the individual participates with other investigators in a joint investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point. NASA reserves the right not to make an award or cancel this AO at any time.

III. SELECTION WITHOUT DISCUSSION

The Government intends to evaluate proposals and award contracts without discussions with offerors. Therefore, each initial offer should contain the offeror's best terms from a

cost or price and technical standpoint. However, the Government reserves the right to conduct discussions, if later determined by the Contracting Officer to be necessary.

IV. NONDOMESTIC PROPOSALS

The guidelines for proposals originating outside of the United States are the same as those for proposals originating within the United States, except that the additional conditions described in Sections 3.7 shall also apply.

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

RESTRICTION ON USE AND DISCLOSURE OF
PROPOSAL AND QUOTATION INFORMATION (DATA)

> The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data), if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS

Submission of cost or pricing data, as defined in FAR 15.401, is required if the combined Phase A and Bridge Phase costs exceed $550,000. Cost or pricing data will also be required for proposals for subsequent mission phases. The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that, following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit or execute all certifications and representations required by law and regulation.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated for such purpose, if the selecting official deems it to offer NASA a significant technical advantage or cost reduction. (See NFS 18-15.208.)

VIII. SOURCE OF SPACE INVESTIGATIONS

Investigators are advised that candidate investigations for space missions can come from many sources. These sources include those selected through the AO, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

IX. DISCLOSURE OF PROPOSALS OUTSIDE THE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal, the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desires to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY

For any NASA contract resulting from this solicitation, the clause at FAR 52.222-26, "Equal Opportunity," shall apply.

XI. PATENT RIGHTS

A. For any NASA contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, New Technology, shall apply. Such contractors may, in advance of a contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, Requests for Waiver of Rights to Inventions.

B. For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR 52.227-11, Patent Rights -- Retention by the Contractor (Short Form), (as modified by NFS 18-52.227-11) shall apply.

XII. RIGHTS IN DATA

Any contract resulting from this solicitation will contain the Rights in Data - General clause: FAR 52.227-14.

XIII. SMALL AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

A. Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns, women-owned small business concerns, Historically Black Colleges and Universities (HBCU's), and other minority educational institutions (OMI's), as these entities are defined in 52.219-8 and in 52.226-2 of the FAR. As part of downselect, offerors' subcontracting plan will be evaluated on the participation goals and quality and level of work performed by small disadvantaged business concerns, women-owned small business concerns, HBCU's, and OMI's. Offerors will be evaluated on the participation in the performance of the mission of small disadvantaged business concerns in the authorized Standard Industrial Classification Groups as determined by the Department of Commerce, see FAR 19.201 (b), as well as the participation of women-owned small business concerns, HBCU's and OMI's.

B. Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed $500,000, and are with organizations other than small business concerns, the clause FAR 52.219-9 shall apply. Offerors whose investigations are selected for implementation leading to flight will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, women-owned, veteran-owned, and HUB Zone small business concerns. Note that these specific subcontracting goals need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after the Stage 2 selection shall make the offeror ineligible for award.

APPENDIX B

GUIDELINES FOR PROPOSAL PREPARATION

INTRODUCTION

The following guidelines apply to the preparation of proposals in response to this SMEX and Missions of Opportunity AO. The material presented is a guide for the prospective proposer and is not intended to be all encompassing. The proposer must, however, provide information relative to those items applicable, as well as other items required by the AO. In the event of an apparent conflict between the guidelines in this appendix and those contained within the body of the AO, those within the AO shall take precedence.

GENERAL GUIDELINES

All documents must be typewritten in English, use metric and standard astronomical units, and be clearly legible. Submission of proposal material by facsimile (fax), electronic media, videotape, or floppy disk is not acceptable except as specifically requested. No proposal may reference a World Wide Web site for any data or material needed for adequate review of the proposal.

The proposal must consist of only one volume, with readily identified sections corresponding to Sections A through H given below. In order to allow for recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Proposers are requested not to use three-ring binders. Photographs and color figures are permitted if printed on recyclable white paper only. The original signed copy must be bound in a manner that makes it easy to disassemble for reproduction. Except for the original, two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits.

Proposals must contain no more pages than given in the table below, with exclusions to the page count as noted below, including no more than four fold out pages (28 x 43 cm; i.e., 11 x 17 inches). A fold out page counts as one page. All pages other than fold out pages shall be 8.5 x 11 inches or A4 European standard.

Single- or double-column format is acceptable. In complying with the page limit, no page may contain more than 55 lines of text and the type font must not be smaller than 12-point (i.e., less than or equal to 15 characters per inch). Figure captions must not be smaller than 12 point. Within figures and tables the font must not be smaller than 10 point.

The following table provides restrictions and guidance on page count within the proposal:

Section	Page Limits
A. Cover Page and Proposal Summary	Printout of electronic submission
B. Fact Sheet	2
C. Table of Contents	2
D. Science Investigation	20
E. Mission Implementation, F. Management, Schedule, and G. Cost and Cost Estimating Methodology	20
H. Education and Public Outreach, New/Advanced Technology, Small Disadvantaged Businesses	2
I. Appendices: (no others permitted) 1. Letter(s) of Endorsement 2. Statement(s) of Work (SOW) 3. Resumes 4. Draft International Participation Plan - Discussion on Compliance with U.S. Export Laws and Regulations 5. Draft Outline of Technical Responsibilities for International Participation 6. Orbital Debris Generation Acknowledgement 7. NASA PI Proposing Teams (1 page) 8. Acronyms List 9. Reference List (optional)	No page limit, but small size encouraged

A. COVER PAGE AND PROPOSAL SUMMARY

A Cover Page and Proposal Summary must be a part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator (PI) and an official by title of the investigator's organization who is authorized to commit the organization. This authorizing signature now also certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Appendix D of this AO; therefore, certifications do not need to be submitted separately.

The Cover Page and Proposal Summary must be submitted electronically to the World Wide Web site located at http://proposals.hq.nasa.gov/proposal.cfm. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, are required on the specified form, as well as the names, institutions, and E-mail addresses of all participants, the type of investigation proposed, the total NASA OSS Cost, and a 200-word Summary. Categories of participants (e.g., collaborator, technical

representative) must match the choices available in the electronic submittal system. A hard copy version of this Cover must be printed in time to acquire signatures and include with the original hard copy of the proposal for delivery according to the schedule provided in Section 1.3 in this AO. Proposers are advised that they must not reformat this Cover after it is printed, as important NASA-required documentation may be lost. Proposers without access to the Web or who experience difficulty in using this site may contact the NASA Peer Review Service Help Desk at r-help@nasaprs.com for general questions and feedback or at research@hq.nasa.gov for technical questions about the web site. The Help Desk phone number is (202) 479-9376. Please note that submission of the electronic Cover does not satisfy the deadline for proposal submission.

It is NASA's intent to enter the Summaries of all selected investigations for its various programs into a publicly accessible database. Therefore, the Summary should not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure.

It is permitted but optional to submit a graphic cover page (color or otherwise). It may be placed in front of the hard copy of the electronically submitted cover page and proposal summary. It will not count against the page limit so long as it does not contain any technical information not found within the body of the proposal.

B. FACT SHEET

A Fact Sheet that provides a brief summary of the proposed investigation must be included in the proposal. The information conveyed on the Fact Sheet must include the following: science objectives (including the importance of the science to the NASA science themes), mission overview (including mission objectives and major mission characteristics), science payload, key spacecraft characteristics, anticipated launch vehicle, mission management (including teaming arrangement as known), schedule, and cost estimate. Other relevant information, including figures or drawings, may be included at the proposer's discretion. The Fact Sheet is restricted to two pages (preferably a double-sided single sheet).

C. TABLE OF CONTENTS

The proposal shall contain a table of contents that parallels the outlines provided below in Sections D through I.

D. SCIENCE INVESTIGATION

1. Overview. The science section must describe the scientific objectives of the proposed investigation, including the value of the investigation to one or more of the specified NASA space science themes. The primary science theme to which the investigation applies must be identified. A discussion of the scientific products and how the science products and data obtained will be used to fulfill the

scientific objectives must be provided. A discussion of how the science data will be obtained, including a plan for delivery of the products, and the individuals responsible for the data delivery, must also be provided.

2. Scientific Goals and Objectives. This section must discuss the goals and objectives of the investigation, their value to the primary and any secondary NASA science themes, and their relationships to past, current, and future investigations and missions. It should describe the history and basis for the proposal. This section must discuss the need for such an investigation. An overview of the mission must be provided. This section must directly address the evaluation criteria for scientific merit described in the AO.

3. Science Requirements. This section must describe the observations and/or data required to meet the scientific objectives. The scientific requirements for the mission must be explicitly described and these must be linked to the scientific objectives of the mission. The requirements that these objectives and observations impose on the mission design elements must be discussed. The required "science objectives-to-measurements-to-mission traceability" may be provided either in narrative or tabular form.

   The measurements to be taken in the course of the mission, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation must be discussed. This description must identify the investigation to be performed, the quality of the data to be returned (resolution, coverage, pointing accuracy, measurement precision, etc.), and the quantity of data to be returned (bits, images, etc.). The relationship between the data products generated and the scientific objectives must be explicitly described, as well as the expected results.

   Examples of a Science Traceability Matrix and a Mission Traceability Matrix are given in Tables B1 and B2 along with examples for elements in such matrixes.

4. Minimum Science Mission (Performance Floor). This section must identify a minimum acceptable data and scientific return for the mission (the Minimum Mission), below which the mission would not be worth pursuing. The value of the Minimum Mission must be discussed. A description of the descope options available, their phasing, their effect on meeting the scientific objectives of the mission, and their value during development (e.g., savings in cost, schedule, or risk), as the mission is descoped from the Baseline to the Minimum Mission must be discussed. In developing the Minimum Mission, the proposer must consider all aspects of the mission (e.g., launch vehicle, instrument, spacecraft, ground system) and not focus entirely on possible instrument descopes or mission length reductions. Proposals must include only one Baseline Mission and one Minimum Mission.

5. Science Implementation.

   a. Instrumentation. This section must describe the instrumentation and the rationale used for its selection. It must identify the individual instruments and instrument systems, including their characteristics and requirements, and indicate items that are proposed to be developed, as well as any existing instrumentation or design/flight heritage.

      A preliminary description of each instrument design with a block diagram showing the instrument systems and their interfaces must be included, along with a description of the estimated performance of the instrument. Performance characteristics must be related to the measurement and investigation objectives as stated in the proposal. Such characteristics include a discussion of the data rates, fields of view, resolution, precision/sensitivity, pointing accuracy, etc.

   b. Mission Design. Mission observing strategy and spacecraft performance required for obtaining the necessary data with the proposed instrumentation must be described. The concept for operating the mission and the requirements for mission operations must be given.

   c. Data Analysis and Archiving. The data reduction and analysis plan must be discussed, including the method and format of the data reduction, data validation, and preliminary analysis. The process by which data will be prepared for archiving must be discussed, including a list of the specific data products and the individual team members responsible for the data products. The plan must include a schedule for the submission of raw and reduced data to the appropriate NASA data archive in the proper formats, media, etc. Delivery of the data to the data archive must take place in the shortest time possible.

   d. Science Team. This section must identify each necessary individual of the investigation science team and their roles and responsibilities. The capabilities and experience of all members of the proposed science team must be described. Resumes or curriculum vitae of team members must be included as attachments to the proposal (see Section I, below). The role of each Co-Investigator must be explicitly defined and justified, and the funding source (NASA or contributed) for the Principal Investigator and each Co-Investigator noted. A letter of endorsement is required from each Co-Investigator's institution if the Co-Investigator's services are contributed (see Section I.1). Other nonfunded members of the proposal team may be included in the proposal as collaborators.

E. MISSION IMPLEMENTATION

This section must provide a description of the mission, including mission design, instrument accommodation, spacecraft, launch vehicle required, ground systems, communications approach, and mission operations plan. Specific information must be included that describes the unique requirements placed on these mission elements by the science investigation.

If the proposed spacecraft bus is in the Rapid Spacecraft Development Office catalog, explain how any changes to the technical specifications given in the catalog are going to be achieved and how those changes affect other subsystems.

As part of this section, the development approach which will assure mission success must be described. The following items must be included in the discussion:

- Heritage and maturity of mission elements (spacecraft, ground systems, and mission design, etc.);
- Approach to use or nonuse of redundancy and other reliability measures (requirements for burn-in of parts, total operating time required without failure prior to flight, etc.);
- Assembly, integration, and test flows and integration and test approach;
- Environmental test philosophy (test flow and sequence, test margins, and test durations);
- Product assurance activities;
- Systems engineering plan and philosophy, and trade studies to be conducted;
- Potential risks to the proposed investigation and plans for mitigating those risks;
- Technology development plans and back-up plans, if technologies do not meet development needs (new technology may be penalized for risk if adequate back-up plans are not described to ensure success of the investigation);
- Identification of instrument to spacecraft interfaces, including integration and test approach;
- Subsystem descriptions including telecommunications, thermal, power, propulsion, attitude determination and control, command and data handling, flight software (including fault protection and safing), and ground software; and
- At a high level, discussion of operations team training, availability of spacecraft experts for operations, operations center development, and planned ground station network.

It is recognized that teaming arrangements to implement the investigation may not be complete at the time of the proposal. Proposers will not be penalized for this if it is demonstrated that there are candidate implementation approaches for the spacecraft, launch vehicle, communications, and ground systems that will allow the successful implementation of the investigation.

In addition to the information above, the specific data identified below must be provided (in tables) as applicable to the mission configuration proposed.

1. General Information
   Launch date (including launch date flexibility), mission duration, orbit type (Earth orbit, heliocentric, etc.), and orbit information (semimajor axis, eccentricity, inclination, node time of day, argument of perigee, altitude), ground station(s) usage (e.g., location(s), transmitting and receiving communication parameters).

2. Downlink Information
   Data volume (Mbytes/day), bit error rate, onboard storage (Mbytes), transmit frequency, power available for communications (Watts), downlink data rate, effective isotropic radiated power (dBW). transmitting antenna type and gain (dBi), modulation and coding (e.g., BPSK, CCSDS, Reed-Solomon), number of data dumps per day, spacecraft data destination (e.g., mission operations center), science data destination (e.g., science operations center), and maximum time lag between data dump and data arrival at destination, if relevant to science needs.

3. Uplink Information
   Number of uplinks per day, number of bytes per uplink, bit error rate, receive frequency, uplink data rate, receiving antenna type and gain (dBi), modulation and coding (e.g., BPSK, CCSDS, Reed-Solomon), and approach and schedule for obtaining license(s) for use of proposed frequency bands.

4. Attitude and Control Requirements
   - Attitude control requirements for the spacecraft pointing control, pointing knowledge (at the instrument interface), pointing stability or jitter (each axis, 3-sigma);
   - Attitude control requirements for bias, drift, stability or jitter, rate for scanning (each axis);
   - Spacecraft attitude knowledge requirements at the instrument interface for bias, drift, jitter, rate for scanning (each axis);
   - Agility (maneuvers, scanning, etc.);
   - Deployments (solar panel, antennas, etc.);
   - Articulation (1, 2 -axis solar arrays, antennas, gimbals, etc.);
   - On-orbit calibration (alignment, line-of-sight, thermal deformation); and
   - Attitude knowledge processing (real-time versus postprocessing, spaceborne versus ground).

5. Resources and Margins
   For satellite (instrument package and spacecraft), provide estimates for mass, power, and reserves at the subsystem level (including propellant), and margins at the system level. For instrument package requirements on the spacecraft, provide pointing, stability, attitude, and maneuvering requirements necessary for science operations (include design margins, when known).

Definitions:

Contingency (or *reserve*) when added to a resource, results in the maximum expected value for that resource. Percent contingency is the value of the contingency divided by the value of the resource less the contingency.
Margin is the difference between the maximum possible value of a resource (the physical limit or the agreed-to limit) and the maximum expected value for a resource. Percent margin for a resource is the available margin divided by its maximum expected value.
Example: A payload in the design phase has an estimated mass of 115 kg including a mass reserve of 15 kg. There is no other payload on the ELV and the ELV provider plans to allot the payload the full capability of the vehicle, if needed. The ELV capability is 200 kg. The mass reserve is 15/100 = 15% and the mass margin is 85 kg or 85/115 = 74%. Example: The end-of-mission life capability of a spacecraft power system is 200 Watts. The instrument is expected to use 50 Watts, including 25% contingency. It is allotted 75 Watts by the satellite provider. The reserve is 10 Watts and the margin is 25 Watts, or 25/50 = 50%.

6. Instrument Characteristics
   - Bias, drift, and noise of instrument data used in pointing control and knowledge determination; and
   - Character of significant instrument-generated jitter and momentum.

7. Spacecraft Characteristics
   - Number, type, and redundancy of the attitude and control system sensors and actuators;
   - Block diagram of the spacecraft system components; and
   - Figure of the complete spacecraft/instrument system, on the launch vehicle and in-flight, with major components labeled and approximate overall dimensions.

8. SMEX ISS Attached Payloads Information
   For SMEX ISS Attached Payloads, provide the information above that is related to the proposed investigation's requirements on and interfaces with the ISS.

   ISS Attached Payloads proposals must also include:
   - An overview of how the operations plan for the proposed investigation is accomplished.
   - An overview of the conceptual design response to the ISS site interface addressing resource requirements versus the site capabilities.

9. Missions of Opportunity Information
   For Missions of Opportunity, provide the information above that is related to the proposed investigation's requirements on and interfaces with the sponsor's instrument/spacecraft, the ISS, or the LDB, as appropriate.

   Classic Mission of Opportunity proposals must also include:
   - An overview of the total mission;
   - If and how the proposed investigation relates to the spacecraft sponsor's overall mission objectives; and
   - An overview of how the operations plan for the proposed investigation fits within the mission of the sponsoring organization.

   ISS Mission of Opportunity proposers must include an overview of their conceptual design response to the ISS site interface (e.g., EXPRESS Pallet, WORF, or JEM-EF), addressing resource requirements versus the site capabilities. The proposer is not required to document the ISS mission, the EXPRESS Pallet, JEM-EF, or WORF, or the site interfaces.

F. MANAGEMENT AND SCHEDULE

This section must summarize the investigator's proposed management approach. The management organization (including an organization chart) and decision-making process must be described, and the teaming arrangement (as known) must be discussed. The responsibilities of team members, including contributors, and institutional commitments must be discussed. Unique capabilities that each team member organization brings to the team, as well as previous experience (including cost and schedule performance) with similar systems and equipment, must be addressed. The specific roles and responsibilities of the Principal Investigator and Project Manager must be described, but key project personnel (e.g., the Project Manager) need not be identified by name at this time. Risk management and risk mitigation plans must be described. This discussion must include the top 3-5 risks, descoping strategies, if relevant, and management strategies for control, allocation and release of technical, cost and schedule reserves and margins. When contracts are required, the acquisition strategy including any incentive strategy must be described.

Mission of Opportunity proposals must specifically address how the investigation team will interrelate with the sponsoring organization, organizationally and managerially, and describe the status of the commitment from the spacecraft builder/owner or sponsoring organization to fly the proposed instrument or conduct the proposed investigation.

A project schedule to meet the proposed launch date and covering all phases of the investigation must be proposed. The schedule must include, as a minimum, proposed major project review dates, instrument development, spacecraft development (if applicable); instrument-to-spacecraft/host integration and test, launch vehicle integration and launch, and mission operations and data analysis (MO&DA).

Schedule critical path and reserve must be clearly identified. A Mission of Opportunity schedule shall also include the major milestones of the mission sponsor/host and show how the investigation fits in the development plan for the sponsor's mission.

Investigations intending to launch on the Space Shuttle as ISS payloads must address the potential for launch delays which are due to the Shuttle and/or ISS programs and are beyond the proposer's control. Specifics must be given detailing how the investigation team will manage the impact of such launch delays within the proposed cost cap for the mission.

G. COST AND COST ESTIMATING METHODOLOGY

This section shall include an estimated cost of the investigation that encompasses all proposed activities, including all applicable mission phases, launch services, development of the ground data system, fee, and contributions. These costs shall be consistent with the program requirements described in Section 3 and Section 4 or 5, as applicable, of the AO. The amount required in each fiscal year must be identified by providing the data in Table B3 for SMEX investigations and Table B4 for Missions of Opportunity, which will not be counted against the page limit. The top portion of Table B3 and B4 requests cost data relative to the NASA OSS Cost. The lower portion addresses contributions. The cost elements in Tables B3 and B4 are defined in Appendix F. Provide the data requested in Table B5, which will not be counted against the page limit, for the NASA OSS Cost by mission phase. Table B6 gives the NASA inflation index to be used to calculate real year dollars.

Proposers must also submit the data in Table B3 or B4, as appropriate, and Table B5 as separate files. Each cost table, including the headings for the rows and columns, must be in a tab-delimited text file. Each CD that will accompany the original or a copy of the proposal must include these files.

The methodology used to estimate the cost, for example, specific cost model, past performance, cost estimating relationships from analogous missions, must be discussed. Budget reserve strategy, including budget reserve levels as a function of mission phase, must be discussed. Provide assumptions used in developing cost estimates to help facilitate reviewer understanding of proposed cost estimates. Provide rationale that describes why NASA should feel confident that the proposed costs are reasonable and will remain within the cost cap.

Although not a requirement, the proposers are highly encouraged to provide the following items, which will not be counted against the page limit, to enable the validation of their costs.

- Master Equipment List
- Work Breakdown Structure (WBS)
- WBS Dictionary

If a WBS is provided, costing against the WBS will also facilitate cost validation.

H. EDUCATION AND PUBLIC OUTREACH, ADVANCED TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESSES

The proposer must provide a statement that she/he understands NASA OSS requirements for Education and Public Outreach (E/PO) and is committed to carrying out an E/PO program that meets the goals described in Section 3.8. The proposer must also provide a brief overview of the planned E/PO activities and their relationship to the proposed mission. This overview must include a brief discussion of any unique characteristics of the mission which might provide unusual opportunities for E/PO. Detailed plans for implementing the E/PO activities, including identification of and formal commitment from E/PO partner institutions, will be part of the Phase A concept study and will be evaluated as part of the downselection process.

The proposer must provide a statement that she/he understands NASA OSS goals for new/advanced technology transfer and intends to address these goals. Details of the plans for addressing these goals will be part of the Phase A concept study and will be evaluated as part of the downselection process.

The proposer must provide a statement that she/he understands NASA OSS requirements for participation of Small Disadvantaged Businesses and Minority Institutions and intends to comply with these requirements. Details of the plans for addressing these requirements will be part of the Phase A concept study and will be evaluated as part of the downselection process.

I. APPENDICES

The following additional information is required to be supplied with the proposal as Appendices and, as such, will not be counted within the specified page limit. NO OTHER APPENDICES ARE PERMITTED.

1. Letters of Endorsement. Letters of endorsement must be provided from all organizations offering critical goods and/or services (including Co-Investigator services) on a no-exchange-of-funds basis, non-U.S. organizations providing hardware or software to the investigation, and the major participants in the proposal. Letters of endorsement must provide evidence that the institution and/or government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA. They must be signed by institutional and/or government officials authorized to commit their organizations to participation in the proposed investigation. Institutional letters of endorsement for Co-Investigators to be funded by NASA OSS are not required with the proposal but will be required as part of the Phase A

concept study report. Additional requirements for letters of endorsement may be found in Sections 3.6.2 and 3.7.3.

2. Statement of Work (SOW) and Funding Information. For investigations managed from non-Government institutions, provide a SOW. For investigations managed from Government institutions, provide a SOW as if the institution were non-Government. This SOW must include the requirement for a Phase A concept study report that is described in the *Guidelines and Criteria for the Phase A Concept Study* document available through the Explorer Program Library. The SOW must include general tasks statements for Phases B/C/D and for Phase E. All SOW's must include Scope of Work and Government Responsibilities (as applicable). SOW's need not be more than a page or two in length. If more than one contractual arrangement between NASA and the proposing team is required for Phase A or the Bridge Phase, information must be provided which identifies how funds are to be allocated among the organizations.

3. Resumes. Provide resumes or curriculum vitae for the PI and all Co-Investigators identified in the science section and for any key project personnel. The resume must clearly show experience related to the job the individual will perform on the proposed investigation. If the PI or PM (if identified) have project management experience, it must be included in their resume. Resumes or curriculum vitae should be no longer than three pages for the PI and one page for each additional participant.

4. Draft International Participation Plan - Discussion on Compliance with U.S. Export Laws and Regulations. Investigations that include international participation, either through involvement of non-U.S. nationals and/or involvement of non-U.S. entities must include a section discussing compliance with U.S. export laws and regulations; e.g., 22 CFR 120-130, *et seq*. and 15 CFR 730-774, *et seq*., as applicable to the scenario surrounding the particular international participation. The discussion must describe in detail the proposed international participation and is to include, but not be limited to, whether or not the international participation may require the proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available through Internet URL's http://www.pmdtc.org/ and http://www.bxa.doc.gov/. Proposers are advised that under U.S. law and regulation, spacecraft and their specifically designed, modified or configured systems, components, parts, etc., such as the instrumentation being sought under this AO, are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations, 22 CFR 120-130, *et seq*.

5. Outline of Assignment of Technical Responsibilities between U.S. and International Partners. These outlines will be used by NASA at selection as the starting point for formalizing the agency-to-agency agreements that will be required if the investigation is implemented.

6. Orbital Debris Generation Acknowledgement. In compliance with NPD 8710.3 (NASA Policy For Limiting Orbital Debris Generation), all missions will need to conduct a formal assessment during Phase A of the orbital debris the spacecraft will create upon mission termination. Orbital debris refers to spacecraft disposal as well as debris that may potentially survive reentry.

   This appendix must briefly discuss whether the proposer anticipates that spacecraft disposal will be required at mission termination. If it is anticipated that a spacecraft disposal plan will be required to mitigate the impact of orbital debris, the appendix must briefly demonstrate that the proposed mission contains sufficient resources (mass, budget, fuel, etc.) to accommodate a spacecraft disposal plan.

   NSS 1740.14 states that the risk of human casualty per reentry event has to be less than 0.0001. For spacecraft at an inclination of 28 degrees, this translates into a total debris area for components and structural fragments surviving reentry of 8 m^2. If the assessment to be conducted during Phase A indicates that the spacecraft will produce a larger debris area, a proper disposal of the spacecraft upon mission termination will need to be specified in the Phase A report. NSS 1740.14 is available at: http://www.orbitaldebris.jsc.nasa.gov/mitigate/nss1740/nss1740.html.

   This evaluation can be made with the Debris Assessment Software written and maintained by Orbital Debris Program Office at the Johnson Space Center. The software and additional information can be obtained at: http://www.orbitaldebris.jsc.nasa.gov/mitigate/mitigation.html.

7. NASA Principal Investigator Proposing Teams. Proposals submitted by NASA employees as Principal Investigators must contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal must (i) indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii) describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above must include at least the following competitive aspects: notice of the opportunity to participate to potential sources; submissions from and/or discussions with potential sources; and objective criteria for selecting team members among interested sources. The proposal must address how the selection of the proposed team members followed the objective criteria and is reasonable

from both a technical and cost standpoint. The proposal must also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the Principal Investigator verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.

8. List of Abbreviations and Acronyms.

9. List of References. In addition to the above items, a References List may be provided that identifies reference documents and materials that were fundamentally important in generating the proposal. If documents and materials themselves are submitted as a part of the proposal, they must be included within the prescribed page count.

TABLE B1
SCIENCE TRACEABILITY MATRIX

Science Objectives	**Scientific Measurement Requirements**	**Instrument Functional Requirements**	**Mission Functional Requirements (Top-Level)**

TABLE B2
MISSION TRACEABILITY MATRIX

Mission Requirement	**Spacecraft Requirement**	**Ground System Requirement**	**Operations Requirement**

Kinds of information to be addressed in the matrixes B1 and B2 (not all inclusive):

<u>Requirements on Mission</u>
Orbit information (type, altitude, inclination)
Launch vehicle and any upper stages
Launch date and launch date flexibility
Mission duration
Number of satellites

<u>Requirements on Spacecraft/Balloncraft/Host</u>
Control method (3-axis stabilized, spinner, gravity-gradient)
Pointing control, knowledge, and jitter
Slew Rates
Data storage
Special thermal requirements
Power required by instruments
Radiation environment

<u>Requirements on Communications and Ground Data System</u>
Data Volume (Mbytes per day)
Number of data dumps per day
Real time requirements

<u>Requirements on Mission Operations</u>
Maneuvering, including constraints on maneuvering

TABLE B3
TOTAL MISSION COST FUNDING PROFILE TEMPLATE
FOR SMEX INVESTIGATIONS
(FY costs[1] in Real Year Dollars, Totals in Real Year and 2003 Dollars)

Cost Element	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2003)
NASA OSS Cost									
Phase A									
Phase B									
Reserves									
Phase C/D PM/MA/SE[2]									
Instruments*									
Instrument IAT[3]									
Spacecraft Bus									
Spacecraft IAT[3]									
Other H/W Elements*									
Launch + 30 Days Ops									
Science Team									
Pre-Launch GDS/MOS[4]									
E/PO[5]									
DSN[6]									
Other*									
Instrument Reserves									
Spacecraft Reserves									
Other Reserves									
Phase E PM[2]									
MO&DA[7]									
DSN[6]/Tracking									
E/PO[5]									
Other*									
Reserves									
Launch services									
Total Capped Cost	$	$	$	$	$	$	$	$	$
Phase F Activities[8] (specify)									
Total NASA OSS Cost	$	$	$	$	$	$	$	$	$
2-Month Bridge Phase[9]									
Contributions									
Cost Elements Above*									
Total Contributions	$	$	$	$	$	$	$	$	$
							Total Mission Cost		$

* Specify each one in separate row
1 Costs must include all costs including any fee
2 PM/MA/SE - Project Management/Mission Analysis/Systems Engineering
3 IAT - Integration, Assembly and Test
4 GDS/MOS - Ground Data System/Mission Operations Services
5 E/PO - Education /Public Outreach
6 DSN - Deep Space Network
7 MO&DA - Mission Operations and Data Analysis
8 Optional. See Section 3.3.2
9 Also include within Phase B and within Total NASA OSS Cost

TABLE B4
NASA COST FUNDING PROFILE TEMPLATE
FOR MISSIONS OF OPPORTUNITY
(FY costs[1] in Real Year Dollars, Totals in Real Year and 2003 Dollars)

Cost Element	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2003)
Phase A									
Phase B									
Reserves									
Phase C/D PM/MA/SE[2]									
Instruments*									
Instrument IAT[3]									
Science Team									
Pre-Launch GDS/MOS[4]									
E/PO[5]									
Other*									
Instrument Reserves									
Other Reserves									
Phase E PM[2]									
MO&DA[6]									
E/PO[5]									
Other*									
Reserves									
Total Capped Cost	$	$	$	$	$	$	$	$	$
Phase F Activities[7] (specify)									
Total NASA OSS Cost	$	$	$	$	$	$	$	$	$
2-Month Bridge Phase[8]									

* Specify each one in separate row
1 Costs must include all costs including any fee
2 PM/MA/SE - Project Management/Mission Analysis/Systems Engineering
3 IAT - Integration, Assembly and Test
4 GDS/MOS - Ground Data System/Mission Operations Services
5 E/PO - Education /Public Outreach
6 MO&DA - Mission Operations and Data Analysis
7 Optional. See Section 3.3.2
8 Also include within Phase B and within Total NASA OSS Cost

TABLE B5

MISSION PHASE SUMMARY
FOR NASA OSS COST
(FY costs[1] in Real Year Dollars, Totals in Real Year and 2003 Dollars)

Mission Phase	FY1	FY2	FY3	FY4	FY5	...	FYn	Total (Real Yr.)	Total (FY 2003)
Phase A/B									
Phase C/D									
Phase E									
Phase F									
Launch Services									
NASA OSS Cost, FY Totals	$	$	$	$	$	$	$	$	$

1 Costs must include all costs including any fee

TABLE B6

NASA NEW START INFLATION INDEX

Fiscal Year	2003	2004	2005	2006	2007	2008	2009	2010
Inflation Rate	0.0%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%
Cumulative Inflation Index	1.0	1.031	1.063	1.096	1.130	1.165	1.201	1.238

Use an inflation rate of 3.1% for years beyond 2010.

APPENDIX C

CONTENTS OF THE EXPLORER PROGRAM LIBRARY

The Explorer Program Library includes documents available electronically via the Internet, as well as paper copy. Proposers are requested to access the document electronically where possible. Only limited paper copies of documents are available. Please note that not all documents are available via the Explorer Program Library, but access information is provided.

It is incumbent upon the proposer to ensure that the documents used in proposal preparation are of the date and revision listed in the Announcement of Opportunity or this appendix.

The Explorer Program Library is accessible at the World Wide Web address http://explorer.larc.nasa.gov/explorer/sel.html.

Requests for paper copies should be submitted in writing to:

Explorer Program Library
Mail Stop 160
Langley Research Center
National Aeronautics and Space Administration
Hampton, VA 23681-0001
U.S.A.
Fax: (757) 864-8894
E-mail: c.a.liceaga@larc.nasa.gov

Office of Space Science (OSS) Strategies and Policies

The Space Science Enterprise Strategic Plan (November 2000)

This document is a concise statement of the goals and outlook of NASA's Space Science Enterprise. It is a compilation of the major ideas described in more detail in the context of the overall NASA Strategic Plan.

Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs (March 1995)

This document describes the overall strategy for integrating education and public outreach (E/PO) into NASA's space science programs.

Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy (October 1996)

This document describes OSS's overall approach to implementing its E/PO strategy.

Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria (February 2002)

This document provides answers to frequently asked questions, elaboration of each of the OSS E/PO criteria. Document is intended to give a flavor of what exemplary E/PO can be.

FY 2001 OSS Education and Public Outreach Annual Report (February 2002)

This document summarizes the E/PO programs conducted in FY2001.

The Space Science Enterprise Integrated Technology Strategy (October 1998)

This document describes efforts to manage technology infusion into future OSS missions and to promote technology transfer to the private sector.

Space Science Roadmaps

The science themes of the NASA OSS, through the Space Science Advisory Committee and its subcommittees, have developed Roadmaps. These planning documents prioritize the space science goals for NASA for the years 2003-2023. The following Roadmaps apply to the Explorer program:

Sun-Earth Connection Roadmap, Strategic Planning for the Years 2000 - 2025 (November 1999)

This document describes the Sun-Earth Connection Theme Roadmap.

Cosmic Journeys to the Edge of Gravity, Space, and Time: Structure and Evolution of the Universe Roadmap 2003-2023 (September 1999)

This document describes the Structure and Evolution of the Universe Theme Roadmap.

Origins Science Roadmap (2000)

This document describes the Astronomical Search for Origins Theme Roadmap.

Astrobiology Roadmap (January 1999)

This document describes the Astrobiology Roadmap.

Space Science Supporting Documents

Astronomy and Astrophysics in the New Millennium (2000).

National Research Council report of the decennial Astronomy and Astrophysics Survey Committee. A study undertaken by the Space Studies Board and the Board on Physics and Astronomy of both ground and space based astronomy recommends priorities for new initiatives in the decade 2000 to 2010.

Solar and Space Physics: A Community Assessment and Strategy for the Future (2002).

National Research Council report of the Solar and Space Physics Survey Committee. A study undertaken by the Space Studies Board and the Board on Physics and Astronomy of both solar and space physics recommends priorities for new initiatives in the decade 2003 to 2013. [anticipated publication fall 2002]

Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century (2002).

National Research Council report of the Committee on the Physics of the Universe. A study undertaken by the Board on Physics and Astronomy assessing the science opportunities at the intersection of physics and astronomy.

Gravitational Physics: Exploring the Structure of Space and Time (1999)

National Research Council report of the Committee on Gravitational Physics. A research briefing by the Board on Physics and Astronomy to reassess the opportunities for scientific advances in gravitational physics.

A New Science Strategy for Space Astronomy and Astrophysics (1997)

National Research Council report of the Task Group on Astronomy and Astrophysics. A study undertaken by the Space Science Board to determine the principal scientific issues that the discipline of space science would face during the period 1995-2015.

A Science Strategy for Space Physics (1995).

National Research Council report of the Committee on Solar and Space Physics and the Committee on Solar-Terrestrial Research. A study undertaken by the Space Studies Board recommends the major directions for scientific research in space physics for the coming decade.

Opportunities in Cosmic-Ray Physics and Astrophysics (1995)

National Research Council report of the Committee on Cosmic-ray Physics. A review was undertaken by the Board on Physics and Astronomy to review the field that addresses both experimental and theoretical aspects of the origin of cosmic radiation from outside the heliosphere.

Cosmology, A Research Briefing (1995)

National Research Council report of the Panel on Cosmology. A research briefing by the Board on Physics and Astronomy to reassess the opportunities for scientific advances in cosmology.

Exploration and the Search for Origins: A Vision for Ultraviolet - Optical - Infrared Space Astronomy (May 1996)

Report of the "HST and Beyond Committee" on possible missions and program for UVOIR astronomy in space for the first decades of the twenty-first century.

A Roadmap for the Exploration of Neighboring Planetary Systems (August 1996)
Jet Propulsion Laboratory report. Mission and Technology Roadmap presentation to the Townes Blue Ribbon Panel.

Recommended Priorities for NASA's Gamma-Ray Astronomy Program 1996-2010 (June 1999)
Report of the Gamma Ray Astronomy Program Working Group.

15-Year Plan for X-Ray Astronomy (June 1999)
Report of the X-Ray Astronomy Program Working Group.

The Emergence of the Modern Universe: Tracing the Cosmic Web (November 1999)
Report of the Ultraviolet-Optical Astronomy Program Working Group.

Report of the Living With a Star Science Architecture Team (August 2001)
Report of the Living With a Star Science Architecture Team.

SMEX Guidelines and Requirements Documents

SMEX Expendable Launch Vehicle Services Information Summary
This document provides information and points of contact on available expendable launch vehicles.

SMEX Long Duration Balloon Opportunities
This document provides information and points of contact on LDB mission opportunities.

SMEX International Space Station Opportunities
This document provides information and points of contact on SMEX ISS opportunities.

NASA's Mission Operations and Communications Services
This document provides information and points of contact on the functions and costs of NASA provided Ground Data Systems and Mission Operations and Data Analysis.

SMEX – Available GSFC Services
This document provides information and points of contact on GSFC services available to SMEX and Mission of Opportunity proposers.

Office of Space Science Mission Extension Paradigm
This document describes the guidelines used by OSS Senior Reviews when reviewing extended mission proposals.

SMEX Guidelines for Concept Study Preparation

This document describes the requirement for preparation of the Phase A Concept Study Report.

SMEX – Sample Terms and Conditions for the Phase A (Concept Study) Contract

This document describes the requirements for a Phase A Concept Study Contract.

Safety, Reliability, and Quality Assurance Requirements

SMEX Safety, Reliability, and Quality Assurance Requirements

This document describes the responsibilities of the PI with regard to Safety, Reliability, and Quality Assurance.

ELV System Safety Milestones and Process Flow

This document provides system safety assessment and engineering support for ELV missions.

NSTS System Safety Milestones and Process Flow

This document provides system safety assessment and engineering support for NSTS (Space Shuttle) missions.

National Scientific Balloon Facility Ground Safety Plan

This document is the Balloon Ground Safety Plan (BGSP) for operations performed by the National Scientific Balloon Facility (NSBF).

National Scientific Balloon Facility Payload Safety Process

This document outlines the NSBF's process of certifying and documenting that a balloon payload is in compliance with applicable safety requirements during integration and launch.

General Guideline and Requirements Documents

NPG 7120.5A – Program and Project Management Processes and Requirements (April 1998)

This document provides a reference for typical activities, milestones, and products in the development and execution of NASA missions.

NASA Independent Assessment Team (NIAT) Report (2000)

Report of the NASA Independent Assessment Team.

Example Mission Definition and Requirements Agreement

Example of such an agreement.

ISO 9000 Series

The following ISO 9000 quality documents describe current national and NASA standards of quality processes and procedures.

ISO 9000:2000, *Quality Management Systems – Fundamentals and Vocabulary*

ISO 9001:2000, *Quality Management Systems – Requirements*

ISO 9004:2000, *Quality Management Systems – Guidelines for Performance Improvements*

"ISO 9000 and NASA," Code Q presentation, April 24, 1995.

Note: The first three ISO 9000-related documents are copyrighted and cannot be reproduced without appropriate compensation. For copies contact:

American Society for Quality
P.O. Box 3005
Milwaukee, WI 53201-3005
U.S.A.
Tel.: (800) 248-1946
URL: http://www.asq.org/

Explorer Program Background

Assessment of Recent Changes in the Explorer Program (December 1996)

Report by the Space Studies Board of the National Research Council.

MIDEX Lessons-Learned Workshop Report (August 1996)

Proceedings from the Medium-class Explorer (MIDEX) Lessons-Learned Workshop held in June 1996.

Explorer Workshop (March 2002)

Presentation material from the Explorer Workshop held in March 2002.

Procurement-related Information

Electronic versions only are available for the following:

Federal Acquisition Regulations (FAR) General Services Administration

(URL: http://www.arnet.gov/far/)

NASA FAR Supplement Regulations

(URL: http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm)

NASA Financial Management Manual
(URL: http://www.hq.nasa.gov/fmm/)

NPG 5800.1E -- Grant and Cooperative Agreement Handbook (May 7, 2002)
(URL: http://ec.msfc.nasa.gov/hq/grcover.htm)

Other

These links are provided for your convenience. No paper copies are available from the Explorer Program Library.

NASA Office of Space Science
(URL: http://spacescience.nasa.gov/)

NASA Online Directives Information System (NODIS) Library
(URL: http://nodis.hq.nasa.gov/)

NASA Technology Database
(URL: http://technology.gsfc.nasa.gov/technology/)

Office of Defense Trade Controls, U .S. Department of State
Includes links to the International Traffic in Arms Regulations (ITAR)
(URL: http://www.pmdtc.org/)

Bureau of Industry and Security, U. S. Department of Commerce
Includes links to the Export Administration Regulations (EAR)
(URL: http://www.bxa.doc.gov/)

Orbital Debris Research at NASA's Johnson Space Center
(URL: http://www.orbitaldebris.jsc.nasa.gov/)

Orbital Debris Mitigation at NASA's Johnson Space Center
(URL: http://www.orbitaldebris.jsc.nasa.gov/mitigate/mitigation.html)

NSS 1740.14 – Guidelines and Assessment Procedures for Limiting Orbital Debris
(URL: http://www.orbitaldebris.jsc.nasa.gov/mitigate/nss1740/nss1740.html)

APPENDIX D

CERTIFICATIONS

Included for reference only. Submission of the signed printout of web page as directed for the Cover Page/Proposal Summary certifies compliance with these certifications.

Assurance of Compliance with the National Aeronautics and Space Administration Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution or organization on whose behalf this assurance is signed, hereinafter called "Applicant.")*

HEREBY AGREES THAT it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 *et seq*.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 *et seq*.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and HEREBY GIVES ASSURANCE THAT it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contract, property, discounts or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.

Certification Regarding Debarment, Suspension, and Other Responsibility Matters Primary Covered Transactions

This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 14 CFR Part 1265.

A. The applicant certifies that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this application been convicted or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or Local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or Local) with commission of any of the offenses enumerated in paragraph A.(b) of this certification;

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or Local) terminated for cause or default; and

B. Where the applicant is unable to certify to any of the statements in this certification, he or she shall attach an explanation to this application.

C. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion -- Lowered Tier Covered Transactions (Subgrants or Subcontracts)

(a) The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principles is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department of agency.

(b) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

Certification Regarding Lobbying

As required by S 1352 Title 31 of the U.S. Code for persons entering into a grant over $100,000, the applicant certifies that:

(a) No Federal appropriated funds have been paid or will be paid by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, in connection with making of any Federal grant, the entering into of any cooperative, and the extension, continuation, renewal, amendment, or modification of any Federal grant;

(b) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting an officer or employee of any agency, Member of Congress, or an employee of a Member of Congress in connection with this Federal grant, the undersigned shall complete Standard Form -- LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(c) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subgrants, contracts under grants, and subcontracts), and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by S1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

APPENDIX E

PROPOSER'S CHECKLIST

Administrative	
1. Proposal arrive on time	§6.3.1
2. Proposal included copy of electronic cover page and summary	§6.3.1
3. Original PI signature included	§6.3.1
4. Original authorizing official signature included	§6.3.1
5. Correct number of copies	§6.3.2
6. Meets page limits	Appendix B
7. Includes CD with every copy	§6.3.2
8. Meets general guidelines (one volume original easy to disassemble, no more than 4 fold out pages, maximum 55 lines text/page, maximum 15 characters/inch --approximately 12 pt font)	Appendix B
9. Required appendices included	Appendix B
10. No additional appendices included	Appendix B
11. Budgets are submitted in required formats	Appendix B
Scientific	
12. Addresses solicited science themes	§1.1
13. Requirements traceable from science to instruments to mission	§3.3.1, Appendix B
14. Appropriate data archiving plan	§3.3.1
15. For full Explorer only (not MO), defines both a baseline mission and a minimum science mission	§4.6
Technical	
16. Proposed complete investigation (Phases A-E) for full Explorer, or allowed type of Mission of Opportunity	§1.1, §5.1
17. Includes E/PO outline and commitment	Appendix B
18. Includes technology and SDB commitment	Appendix B
19. Team led by a single PI	§3.5.1
20. Proposed budget within cost cap	§4.4.2
21. Contributions within contribution limit	§4.4.3
22. Phase A costs within cost limit	§4.5
23. Co-investigator costs in budget	§3.5.2
24. Launch date (for Explorer) or commitment date (for MO) prior to cutoff	§4.4.1, §5.2
25. Domestic letters of endorsement for non-funded (contributed) Co-I's	§3.5.2
26. Domestic letters of endorsement from all organizations contributing critical goods and services, from all major participants, and from any required funding organizations	§3.6.2, Appendix B
27. Foreign letters of endorsement from participating institution	§3.7.3
28. Foreign letters of endorsement from funding agencies including binding law statement	§3.7.3, §3.7.5

APPENDIX F

PROJECT COST ELEMENT DEFINITIONS

Introduction

This is a short dictionary of definitions for the cost elements shown in the tables and discussed in the body of this AO.

Project Management/Mission Analysis/Systems Engineering
Project management costs include all efforts associated with project level planning and directing of prime and subcontractor efforts and interactions, as well as project-level functions such as quality control and product assurance. Mission Analysis includes preflight trajectory analysis and ephemeris development. Systems engineering is the project-level engineering required to ensure that all satellite subsystems and payloads function properly to achieve system goals and requirements. This cost element also includes the data/report generation activities required to produce internal and deliverable documentation.

Instruments
Instrument costs include costs incurred to design, develop, and fabricate the individual scientific instruments or instrument systems through delivery of the instruments to the spacecraft for integration. Costs for instrument integration, assembly, and test are to be shown separately from instrument development. Costs incurred for integration of the instruments to the spacecraft are included in the Spacecraft Integration, Assembly and Test cost element (see below).

Spacecraft Bus
Spacecraft bus costs include costs incurred to design, develop, and fabricate (or procure) the spacecraft subsystems. Costs for integration and assembly are not included in this element. Component level test and burn-in is included in this cost element. System tests are included in Spacecraft IA&T (see below).

Spacecraft Integration, Assembly, and Test (IA&T)
Spacecraft integration, assembly and test is the process of integrating all spacecraft subsystems and payloads into a fully tested, operational satellite system. The total cost of IA&T for a satellite includes research/requirements specification, design and scheduling analysis of IA&T procedures, ground support equipment, systems test and evaluation, and test data analyses. Typical satellite system tests include thermal vacuum, thermal cycle, electrical and mechanical functional, acoustic, vibration, electromagnetic compatibility/interference, and pyroshock.

Launch Checkout and Orbital Operations
Launch checkout and orbital operations support costs are those involving prelaunch planning, launch site support, launch-vehicle integration (spacecraft portion), and the first 30 days of flight operations.

Prelaunch Science Team Support
Includes all Phase B/C/D (prelaunch) support costs for the science team. (See MO&DA below for post-launch component.)

Prelaunch GDS/Mission Operations Services (MOS) Development
Includes costs associated with development and acquisition of the ground infrastructure used to transport and deliver the telemetry and other data to/from the Mission Operations Center and the Payload Operations Center. (For more information, refer to *NASA's Mission Operations and Communications Services* document in the SMEX Program Library.) Includes development of science data processing and analysis capability. Also includes prelaunch training of the command team, development and execution of operations simulations, sequence development, and flight control software. This element includes any mission-unique tracking network development costs.

Mission Operations and Data Analysis (MO&DA)
This cost element refers only to Phase E (postlaunch) and has two major components: Mission Operations and Data Analysis. Mission operations comprises all activities required to plan and execute the science objectives, including spacecraft and instrument navigation, control, pointing, health monitoring, and calibration. Data analysis activities include collecting, processing, distributing and archiving the scientific data. MO&DA costs include postlaunch all costs for people, procedures, services, hardware and software to carry out these activities. It includes post-launch science team support costs. It does not include costs of any "Phase F" activities.

"Phase F" Activities
Options for enlarging the science impact beyond the baseline mission, such as extended missions, guest investigator programs, general observer programs, or archival data analysis programs are termed "Phase F" activities. These costs do not count against the mission funding cap.

Tracking Services including DSN
This line item includes all costs associated with this service for the specific proposed mission profile. (Refer to *NASA' s Mission Operations and Communications Services* document, in the SMEX Program Library.)

Education and Public Outreach
Includes all costs associated with developing and implementing the proposed project's programs for education and public outreach.

Project-Unique Facilities
If the proposed project requires construction or lease of any ground facilities, include here only the portion of costs to be borne by the proposed project, with description of the nature and extent of any cost-sharing arrangements assumed.

Launch Services
Launch vehicles and services are either procured and provided by NASA to launch spacecraft under fixed price contracts, or provided by the proposer. The launch service price includes procurement of the ELV, spacecraft-to-launch vehicle integration, placement of spacecraft into designated orbit, analysis, postflight mission data evaluation, oversight of the launch service and coordination of mission-specific integration activities. (For more information, refer to the *SMEX Expendable Launch Vehicle Opportunities* document in the SMEX Program Library.)

Reserves
In that NASA maintains no reserves for missions, reserves must include those project funds that are not allocated specifically to estimated resources, but are held against contingencies or underestimation of resources to mitigate the investigation risk. Reserves must be reported according to the proposed reserve management strategy. For example, if the reserve is divided into funds to be preallocated to the flight system and instrument payload, with another portion held at the project level, specific dollar amounts to fund each must be identified.

NASA Center Costs (all categories)
Additional costs borne by the project for NASA Center participation. For example, there may be additional project management/systems engineering costs, above those incurred by the spacecraft prime contractor, which are due to NASA employee participation. These costs must be reported on a full-cost accounting basis.